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AUTHOR Morine-Dershimer, Greta
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ABSTRACT

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Tapping Teacher Thinking

Through Triangulation of Data Sets

Greta Morine-Dershimer

Syracuse University

(R&D Rep. 8014)

Research and Development Center for Teacher Education
The University of Texas at Austin

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Abstract

Validity is a central issue in use of self-report data for the investigation of teacher thinking. "Triangulation," or use of several data sets to test, corroborate and elaborate each other, is one method for increasing validity of findings. This paper illustrates a process of triangulation of data obtained by three different data collection procedures: stimulated recall interviews; Kelly Repertory Grid interviews; and ethnographic observations of classroom interaction. Comparative case studies of two junior high school teachers are presented, and data are analyzed to provide information on teachers' cognitive processes and beliefs. Two new procedures for analyzing stimulated recall data are introduced. Starting with the stimulated recall data, each data set is examined in turn, and initial findings are tested, extended, and revised with the addition of each new data set. The potential power of the triangulation method is demonstrated, and potential problems are identified.

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G.M-D.

TAPPING TEACHER THINKING THROUGH TRIANGULATION OF DATA SETS

Greta Morine-Dershimer

One of the problems that faces the researcher interested in the investigation of teacher thinking is the fact that thinking is never really observable, it can only be inferred from other data. This makes the validity of information obtained a central issue in the research process. One method for testing and increasing the validity of findings is the use of more than one data set. Different data sets can be used to test, corroborate, and elaborate each other. This method, often called "triangulation," has the added advantage of enriching the final description of the thinking process under study.

Typically, triangulation has been used to compare perspectives of different observers of the same phenomenon (e.g., Adelman & Walker, 1975; Morine-Dershimer, Ramirez, Shuy & Galluzzo, 1980), but it has also been used to compare the same observers' perceptions of similar events in different settings (e.g., Morine-Dershimer, Galluzzo & Fagal, 1980). In either case, the alternative perspectives serve to validate and illuminate each other, as well as to provide more complete descriptions of the phenomenon under investigation.

The application of the method presented in this paper is more atypical. In fact, some purists may object to the term, "triangulation," being used at all here, for in this instance we are comparing not the perspectives of three different observers, but rather the perspectives provided by three different <u>methods</u> for collecting data on teacher thinking. Aside from this aberration, the general analytic

approach is similar to that normally used. Three sets of data are used. Analysis begins at one point on the "triangle," that is, with one set of data. Interpretations developed on the basis of this data set are tested and revised on the basis of data provided by the other two sets of data. The analysis of all three data sets is carried out by one investigator (sometimes it is one team of investigators). Judith Green (1982) has suggested that the process is really more akin to a pyramid than a triangle, since the analysts seem to stand "above" the three data sets as they weigh and interpret the findings.

This paper illustrates this process of triangulation of data sets by presenting the comparative case studies of two junior high school teachers working in the same school, who approach classroom management and discipline from different belief systems. Data on these two teachers include:

1) stimulated recall interviews focusing on their lessons with one of their classes, conducted periodically over the fall semester of the school year;

2) Kelly Repertory Grid interviews dealing with their views of their own teaching practices, their perceptions of their pupils, and their beliefs about student misbehavior; and

3) ethnographic descriptions of the classroom interaction in the lessons for which stimulated recall interviews were conducted.

It is worth noting that the first two sets of data present alternative perspectives of the same "observer," for in both stimulated recall interviews and Kelly Repertory Grid interviews teachers are providing self-report data about their own thinking. The ethnographic descriptions provide the perspective of an outside observer and focus

attention on teacher behavior. The assumption is that this behavior reflects teacher thinking to some degree (Shavelson & Stern, 1981).

Data from the stimulated recall interviews are presented first, and the comparative descriptions derived from these data are then tested against data from the Kelly Repertory Grid interviews, and the ethnographic descriptions of classroom interaction. Brief descriptions of the data collection and data analysis procedures used with these different data sets are presented in each case. This paper will concentrate on the process of integrating the results of the various sets of information.

In all cases the data are analyzed, as objectively as possible,[1] in order to gather information on two aspects of teacher thought: cognitive processes (e.g., complexity of thought, and focus of attention on various elements of instruction/management); and beliefs (both explicit and implicit). The net result of the analysis and synthesis of information provided by the three data sets is a description of teacher thinking by the researcher. The teacher might not describe his/her own thinking in exactly the same terms, and indeed might be unaware of some aspects that seem evident to the researcher. The true test of the description is whether it can provide the teacher and the outside observer or researcher with new insights into the behavior and thinking of the teacher, and allow the observer to predict future preactive and interactive behavior, given similar classroom situations.

The presumed value of the triangulation of data sets is that this method increases the probability that new insights will indeed emerge from the data, and that verifiable predictions can be made. This is

because the description provided by the initial data set is tested against the descriptions provided by each of the other two data sets. The reader may judge for him/herself the degree to which the addition of each new data set substantiates or reshapes the descriptions of the two teachers in the case studies presented here.

Stimulated Recall Data

Method

Data collection. Stimulated recall of teacher thinking during interactive lessons is a data collection procedure that has been used in a number of studies of teacher decision making and information processing (Shavelson & Stern, 1981). The procedure used in this study was to videotape a lesson, and to play the complete videotaped lesson back to the teacher on the same day, asking the teacher to stop the videotape at points where decisions were being made. At times the interviewer stopped the tape to ask what the teacher was thinking about at that particular point. Whenever the tape was stopped, the teacher would comment on what s/he was thinking about, or noticing, or deciding at that point in the lesson. The interviewer might ask probing or clarifying questions about the teacher's comments. These interviews were audiotaped and transcribed for later coding and analysis.

In this study, replaying of the videotape was preceded by the interviewer's request to "summarize" the lesson, and the teacher's summary was usually followed by a question from the interviewer as to "how you thought the lesson went." As a result, almost every stim-

ulated recall protocol contains some teacher comments about lesson goals and lesson evaluation. This has not typically been the case in other studies using this data collection device.

Data analysis. Several types of analysis of the stimulated recall data will be presented here. The first is a fairly standard procedure, in which teacher comments have been coded according to a category system which is both reflective of the topics initiated by teachers, and responsive to the questions that guided researchers conducting this study, which focused on classroom management and discipline. The two teachers are compared on the basis of the proportional frequency of comments (made in discussing events in the lesson) which are representative of the various coding categories. A graphic profile is used for this purpose. This type of analysis tends to provide useful information about the teacher's focus of attention on various elements of interactive instruction.

The second analysis involves an examination of the tone and content of teacher comments within each category, to identify more qualitative similarities and differences in teacher thinking. This procedure provides a useful supplement to the categorical analysis, since teachers talking about similar topics (e.g., instructional goals) are not necessarily revealing similar beliefs or thought processes.

The third analysis focuses on the sequencing of teacher thoughts in discussing a single classroom event, and adapts a procedure used by Flanders (1970) for the analysis of sequences of interactive behavior. To my knowledge, this procedure has never been used before

with stimulated recall data, but it appears to provide productive information about cognitive processes in the comparison of these two teachers.

The fourth analysis focuses on teacher language use, particularly the use of imagery, in discussing classroom events, and describes "themes" in teacher thinking that seem to be revealed by these patterns of language use. This type of analysis yields information relative to teachers' implicit beliefs.

These various types of analysis of the same set of data can be used as a device to strengthen the descriptive power of the initial data set. The results of each analysis will be presented in turn, then the findings will be integrated in a composite description of the cognitive processes and beliefs of each of the two teachers, as revealed by the stimulated recall data.

Subjects. The two teachers to be compared here are Mr. Allan (fictitious names are used throughout for both teachers and pupils), who is observed working with a class of seventh graders studying Texas history, and Miss Baker, who is observed working with a class of eighth graders studying English. Both classes contain predominantly Anglo students, with a few Blacks and Mexican-Americans included. Both classes include students with a range of academic ability.

Examples of coded comments. Figure I presents a list of categories used in coding stimulated recall protocols in this study, together with sample comments under each category, made by Mr. Allen and Miss Baker, in discussing two lessons that each taught in mid-October.[2]

FIGURE I
Stimulated Recall Categories:
Examples From Two Teachers

GOALS: Content Knowledge/Skill

Mr. Allen: My goal was to cover these explorers...De Gama, Coronado, Estanvanico, and another one I can't think of.

Miss Baker: The goal was to let them see that there is a rule for each and every comma that they use...to see the rule, and be able to put the comma in there, and say, "Well, this is why I did it."

GOALS: Activity

Mr. Allen: Well, get those (pages), what was it-105 to 109, read, get those questions discussed, get 'em to work on the notebook, that's what I wanted to get done.

Miss Baker: Little by little, we're going to do a lot of punctuation papers...Practice, practice, practice...The more they do themselves, the better they'll get it, so we'll be doing a lot of handouts on punctuation, I think, for a while.

EVALUATION: Instruction/Learning

Mr. Allen: Our class today was all right. Certainly wasn't disappointed. I got accomplished what I wanted to get accomplished.

Miss Baker: Most of their stories, or their descriptions were pretty good. I wish they would have come up with more unusual adjectives... I'm looking for exciting adjectives, but they'll get to that point. They're still working on paragraph form, I guess, and sentence structure.

EVALUATION: Process/Management

Mr. Allen: I felt like it might have been a little too much disturbance there at the very last, for some reason or other. Why, I don't know.

Miss Baker: I think...the punctuating exercises, I should have ended that sooner...It didn't take them that long to go through this and some were already starting to chatter and bother people quicker than I expected them to, so I should have ended that a little faster.

PUPIL CHARACTERISTICS: General, Academic

Mr. Allen: Fourth period...I have a couple in there that it's all they can do to-you put down there, Coronado, and they blow up, they couldn't no more handle that than nothing (read it)...I thought they would all be in Special Ed., but they're not.

FIGURE I
(continued)

Miss Baker: With some kids a problem is the fact that they do talk exactly like they write...All the kids, of course, use slang, and they'll put the slang word down, just as if they'd said it, "'cause."

PUPIL CHARACTERISTICS: General, Management

Mr. Allen: I have noticed sometimes kids are a little more active on a day when the weather has changed, and the weather has changed (today).

Miss Baker: We're easily distracted as human beings...For eighth graders especially, school--they're not here because they want to be, they're here because they have to, and if they can kid around a little bit, they're gonna try and do it. And so, it doesn't bother me a whole lot.

PUPIL CHARACTERISTICS: Ethnicity, Gender

Mr. Allen: Most times girls will take the writing (as punishment) and boys will take the licking. That's generally, but not always, true.

Miss Baker: With my black students, it seems to be a real, real problem...They have a lot of trouble with putting their endings on their words...I think sometimes they speak that way. "She look very sad today, miss"...instead of saying, "She looks very sad."

PUPIL CHARACTERISTICS: Individual, Academic

Mr. Allen: Both of these boys are really a little immature. Sam's a good deal smarter than what Dan is. Dan just really don't have a lot to begin with...He's repeating.

Miss Baker: Cal likes me to come check his work out a lot...He's unsure of himself, and he likes to be sure that he's doing it right.

PUPIL CHARACTERISTICS: Individual, Management

Mr. Allen: I've got Dan and Sam...where I can keep my eye on them pretty good, and that's about all I really have to worry about in that class.

Miss Baker: Stella is very self-conscious...she wants a tremendous amount of attention...she'll do anything to get that teacher's attention...But she has a very difficult time being social with kids. She can't seem to interact real well, and the kids shy away from her.

FIGURE I
(continued)

PUPIL CHARACTERISTICS: Individual Change

Mr. Allen: (No comments in this category)

Miss Baker: Vicki's whole problem was...lack of self-esteem, and... her way of coping with it was to be "show-offey" and obnoxious, and unruly...I rewarded her whenever she was being sweet, and kind and good in the classroom...she picked that up immediately and that's what she wanted all along...so we haven't had a bit of trouble since then.

TEACHER REACTIONS TO PUPIL BEHAVIOR: Instructional

Mr. Allen: (No comments in this category)

Miss Baker: Cal had a good start; I remember looking at his paper, and he had a good start...I was glad to see that he had a good beginning of a sentence.

TEACHER REACTIONS TO PUPIL BEHAVIOR: Management

Mr. Allen: Of course, I've got my head down, looking at that book, but I'm fairly confident that they're keeping up.

Miss Baker: She looks bored, doesn't she? But she's listening. Cause she's always raising her hand...There she goes.

Mr. Allen: (Girl waving hands as if to ward off teacher's sexist comments) I could have made a big deal of it, but just decided... if it keeps on, I'll get her. (I thought) she was doing the same thing with her hands as I was doing with mine. Since that's the first time, we'll just cut her a little slack, and keep the class moving, see. I thought that would be how to handle that well.

Miss Baker: Deswick is going to have to be moved...I just can't have that constant shouting things out that he does. I try to ignore it, but it's real hard, and he pivots around and talks to too many people, so he needs to be somewhere else.

EXPLANATION OF STRATEGY: Instructional

Mr. Allen: (He answers question from textbook himself, rather than asking pupils,) That's because I had taught four classes (today) and nobody had done very well on (that question) and I decided I'd go ahead and tell them.

FIGURE I
(continued)

Miss Baker: They know words in their mind...that they want to use. But they don't know how to spell them, and that's okay. I don't expect them to know how to spell every single word, and I don't expect them to run up here to the dictionary, stop in the middle of their writing...So, as quietly as I can, I'll take their pencil, and I'll just write the correct word and just say, "Okay, this is the way you spell this word, but that's okay...I like what you've written."

EXPLANATION OF STRATEGY: Management

Mr. Allen: The reason I chose one student there (to read aloud from text)...I felt like she was loud and everybody could hear her. Instead of giving everybody a chance (to read aloud), which takes more time when you're switching (from student to student), I was hurting for time just a little bit and didn't know whether I was going to finish or not.

Miss Baker: Right here I'm feeling really short on time. I want to move on to something else, but...there's kids who still want to read what they have (written), and if they wrote it, it's worth listening to. I feel like I should give them that chance to read it...but, I wanted to move on.

Mr. Allen: When you're reading like this, in order for them...to be able to find their place, they have to pay attention, you see. So I think that that is the advantage to doing it like this (round robin reading of textbook). The disadvantages to it, the thing I don't like, it's questionable to me whether they all hear, but in a way, if they're all keeping up, they should all understand it anyway.

Miss Baker: At this point I'm thinking maybe I shouldn't be handing these (worksheets) out yet. But I felt like it was a good time because...they seemed to be really writing, finally, after taking forever to get started...Sometimes...if they aren't doing something and you're handing out papers, they get riled up...and you need to settle them down then, after you get the papers handed out. So I like to hand things out while they're doing something else, because I think it keeps the class under control that way...the only thing is, you run the risk of them feeling bombarded, like one of the students said, "Gosh, you give us so much."

PRINCIPLES OF TEACHING

Mr. Allen: I feel like they are going to learn once they repeat it, because once it's repeated, the rest of them will learn what the others

FIGURE I
(continued)

know, hopefully.

Miss Baker: If I start from scratch, from simple concepts...it's so much easier to work into the more difficult concepts. I don't like to plunge into something...and assume that they're going to know (it), because they don't, or they've forgotten...so I don't assume anything, I just start from scratch.

Mr. Allen: I call on students who volunteer. The students I hadn't noticed volunteer before, I try to always pick them, to encourage them to do it again.

Miss Baker: Most of them are raising their hand; if they don't raise their hand, I will call on someone. And I do call on someone if I see he's looking around or reading a book or bothering somebody; then I'll call on him to get him back with the rest of us. But most cases I like to call on those who raise their hands. They feel good, they want to answer, and they're gonna answer a lot of times anyway. just because they want to let everyone know they know. So I call on the ones that raise their hands.

RESPONSE TO SCHOOL RULES/REGULATIONS

Mr. Allen: See, the reason they don't want us to let them write sentences (as punishment), in some schools they like sentences, you know, "I will not talk," and write that. Well, the little rascals get two ballpoints, you see, and they write two words at one time. So that's the reason that's not as good, really. Essays are better. That's why they prefer them here, and I do, too.

Miss Baker: I hate taking roll...A lot of times I'll forget, and a kid comes knocking on your door, and you have to stop what you're doing and take the roll, and I just feel like I've got more to do than take the roll...I know the office needs those records, and I need to know if the student is there, and I know it's important, but it just bothers me...it'd be nice if you could have a student take the roll, but that's against all the rules and regulations; teacher must take her own roll.

AREAS OF TEACHER UNCERTAINTY: Instruction

Mr. Allen: Now I've had teachers when I was in school, you couldn't look it up, you had to know it, and all that...I'm just not that way. Whether that's right or wrong, I don't know, but that's the way I believe is best.

Miss Baker: Now I do talk very loud, but that's because I don't want

FIGURE I
(continued)

anyone to miss a thing I say...But I keep it rolling all the time, I'm always talking...I don't slow up, I don't pause very often. I wonder if that's bad or if that's good. I've heard two different things on that.

AREAS OF TEACHER UNCERTAINTY: Management

Mr. Allen: The students I hadn't noticed volunteer before, I always try to pick on, to encourage them to do it again. And that may work the other way, they may need to volunteer several times before they get the hang of it. Which way is best, I don't really know. That's the way I do it, anyhow.

Miss Baker: It bothered me today...They just didn't want to be quiet today and what the reason is, I don't know...It was a number of things, possibly. Maybe not having step-by-step instructions. Maybe because their writing in their journal first of all didn't appeal to some of them...Maybe because they all felt relaxed and they didn't have to worry because report cards had already (gone) out. There are so many reasons as to why they might have been that way.

AREAS OF TEACHER UNCERTAINTY: Pupil Characteristics

Mr. Allen: (No comments in this category)

Miss Baker: Right there. Deswick's asking...When I said, "Look up there for these directions." Now is that Deswick wanting my attention, am I in the class to look at Deswick, or is that Deswick really, not knowing where we're at? I don't know with him. I don't know. I don't know why he does that.

Categorical Analysis

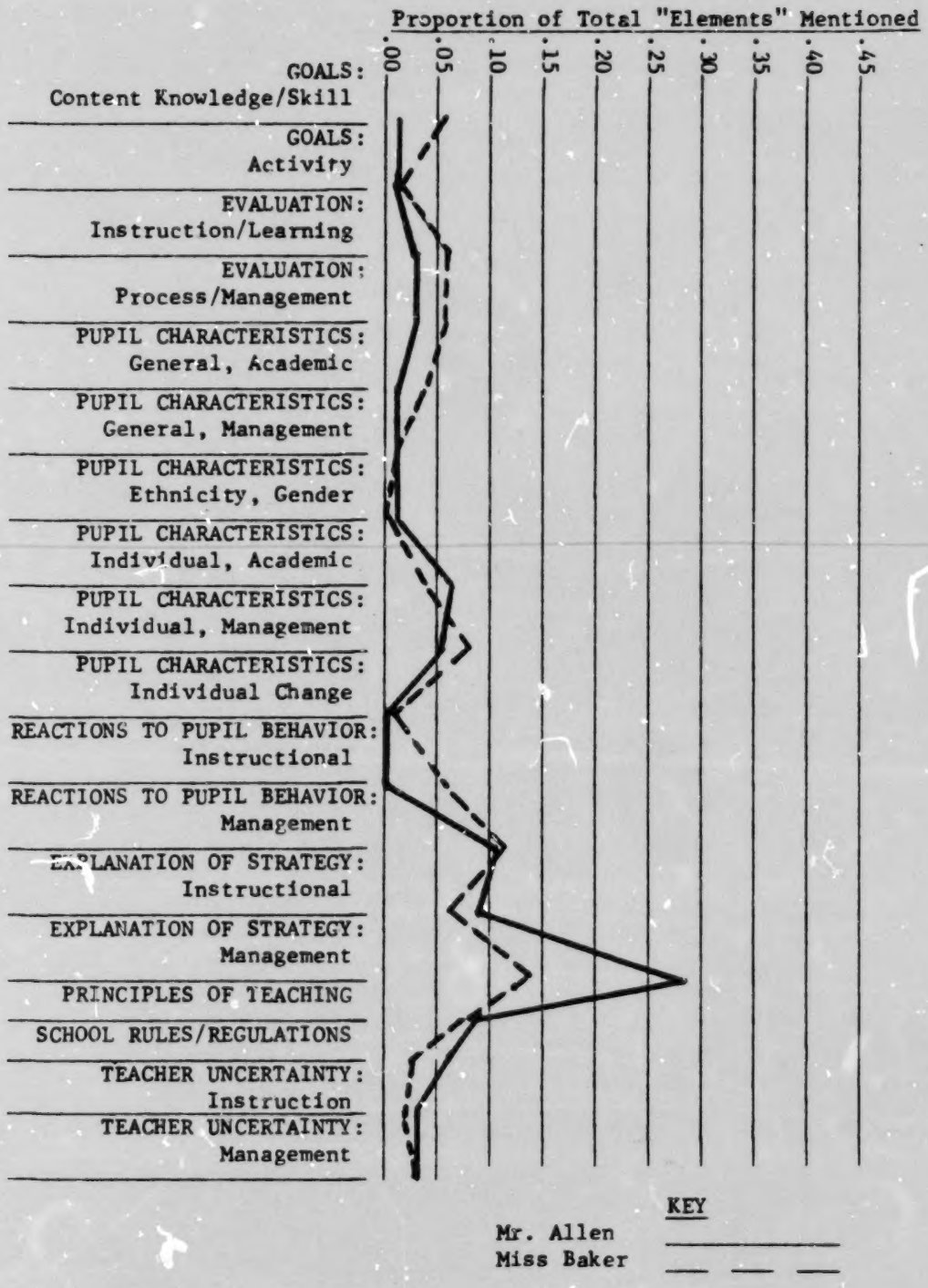
Mr. Allen and Miss Baker do not appear to be drastically different in their thinking about teaching when they are compared on the basis of the most standard type of analysis of stimulated recall protocols, which examines the frequency of comments of the various category types illustrated in Figure I. Figure II presents comparative profiles of these two teachers based on the proportional frequency of comments made in each category.[3] This procedure allows for a useful comparison of the aspects of the lesson that teachers are attending to, even though the actual verbal production may differ markedly.[4]

The principal difference between the two teachers revealed in Figure II is that Mr. Allen is twice as likely to explain the management strategies he is using in a lesson as is Miss Baker. Other, less drastic, differences are that Miss Baker tends to discuss content goals, evaluation of both instruction/learning and process/management, and her reactions to pupils' instructional behavior proportionately more often than Mr. Allen, while Mr. Allen comments on his response to school rules and regulations relatively more often than Miss Baker. It is also the case that Mr. Allen has a single, dominant focus on strategies of management, while Miss Baker's comments are diffused over a larger variety of categories, with no single aspect of the lesson dominating her thinking.

Categorical Content Analysis

When we examine those categories which vary in terms of quantity of teacher use, we can see that they also differ in tone and content.

FIGURE II
Stimulated Recall Profile
(Comparison of Two Teachers)



The examples presented in Figure I are typical for these teachers, and illustrative of this fact.

Miss Baker frames her content goal rather specifically, noting the need for both knowledge and application of a rule. Mr. Allen's goal is more vague. It is to "cover" these explorers. But he himself can't recall the name of one of the explorers that are to be covered in the lesson.

The same type of specificity is evident in Miss Baker's comments on evaluation. She notes the criterion she is using in each case: use of unusual adjectives in written stories is the basis for her judgment about student learning; student chattering is the basis for her judgment about her management of the lesson. Mr. Allen is again vague. He has accomplished what he "wanted to," but feels there might have been a "little too much disturbance." He states no evidence to support either of these judgments.

We can not compare content of teacher comments with regard to teacher reaction to pupils' instructional behavior, for Mr. Allen never once comments about his reactions to pupils' instructional behavior over the course of two lessons. The illustrative comments explaining management strategies show differences in concern about provisions for pupil participation when time pressures are felt, with Miss Baker displaying the greatest concern. The two are similar here in that both indicate awareness of the advantages and disadvantages of management strategies they typically employ. The comparative comments about school rules and regulations indicate that Miss Baker

is frustrated by a standard regulation regarding role-taking, while Mr. Allen concurs with a school rule regarding appropriate punishment procedures.

It is worth noting also that within the categories that appear to be similar in terms of teacher frequency of use, there are some observable differences in tone and content of teacher comments. Within the major category of pupil characteristics, Miss Baker repeatedly discusses pupils in relation to herself (e.g., Cal, Stella, and Vicki), while Mr. Allen notes their attributes without any reference to his own involvement with them. Furthermore, Miss Baker comments several times on positive changes in pupils, to which she has contributed, while Mr. Allen makes no reference to change or growth in pupils. Within the major category of teacher uncertainty, Mr. Allen says he doesn't know whether his procedures are "right or wrong," but demonstrates that it really doesn't matter, since that's the way he does it, "anyhow." Miss Baker seems more willing to consider the possibility of changing her procedures. In considering the possible reasons for her management problems in one lesson, two of her three possibilities deal with her own planning of the lesson.

Thus the quantitative differences in these teachers' attention to various aspects of their lessons, while seemingly minimal in many areas, are reinforced by qualitative differences in the tone and content of their comments.

Analysis of Thought Sequencing

A sequence of teacher thoughts can be identified when a single

lesson event is discussed, and two or more categories of lesson aspects are mentioned in relation to the event. An analysis of this kind of sequencing may reveal the relationships teachers see among different aspects of the lesson.

Mr. Allen and Miss Baker are very different in their use of "streams" of thought. In stimulated recall interviews for two lessons Mr. Allen showed some sequencing of thoughts only twice. Here is one example:

> Sam bothers other students. He talks at the wrong times. He just has a hard time getting with the program. (Pupil Characteristic) I've busted him - I've given him three licks (spanks with a paddle) two different times. He's caught on a little bit, and he's about decided it's not worth all that, but I'll have to do it again, I'm sure of that. (Explanation of Management Strategy) I got him, what'd I get him for today? I wrote it down or something, there, see. What was it? Note writing, that's what it was. (Teacher Reaction to Pupil Behavior)

Miss Baker, in contrast, uses streams of thought quite frequently. In stimulated recall protocols for two lessons, twenty-three lesson events that are discussed call forth some sequencing of thinking on her part. One example is as follows:

> Now I know that half the kids didn't do the homework last night. I know that, because kids don't. And they'll try and get it done as quick as they can before class. I know that. (Pupil Characteristics) I'm not going to go around and give F's to everybody just 'cause they didn't do it. To me that's losing the point of homework. The point of homework is so they come to class a little bit prepared as to what we are gonna talk about, but I'm not here to flunk kids, I'm here to teach them something, not flunk them. (Principle of Teaching) I know that they're going to be sitting there doing it as we go along, but they're more inclined to do it when they think that I'm going to pick it up and give them an F if they don't do it...So they're sitting there doing it as we go along, but nevertheless, they're doing it. (Explanation of Management Strategy)

Since Mr. Allen evinces little thought sequencing, we cannot

examine the patterns of relationships among his thoughts. But we are able to do this for Miss Baker. Figure III shows a "Streams of Thought Matrix," similar to the matrix used by Flanders (1970) to examine interactive behavior sequences. Since this particular anlaysis procedure has never been applied to stimulated recall data before, to my knowledge, it warrants a brief explanation.

Construction and interpretation of the matrix. Each number recorded in the matrix represents a frequency count, denoting the number of times a particular sequence of thought was used in discussing a lesson event. In the illustration of Miss Baker's thought sequences for one lesson event, presented above, she moves from discussion of a Pupil Characteristic to mention of a Principle of Teaching. This is recorded in the cell of the matrix located at the intersection of the Pupil Characteristics line (see labels at left of matrix) and the Principles column (see labels at top of matrix). This particular sequence of comments occurred twice in her discussions of the two lessons reported here, so the number in this box is two. In the final segment of the illustration above, Miss Baker moves from mention of a Principle of Teaching to an Explanation of Management Strategy. This sequence is recorded in the cell of the matrix located at the intersection of the Principles line and the Strategy column. It was the only instance of this particular thought sequence, so the frequency count in this box is one.

Since data from only two lessons are analyzed here, the frequency counts in most of the cells are quite low. This particular analy-

	GOALS	EVALUATION	PUPIL CHARACTERISTICS	TEACHER REACTIONS	STRATEGY	PRINCIPLES	RULES	UNCERTAINTY
GOALS	1	1	1		1	1		
EVALUATION	1		1	1	2			2
PUPIL CHARACTER-ISTICS	1	2		3	4	2		1
TEACHER REACTIONS		4	3		3			
STRATEGY		2	5		2	2	1	1
PRINCIPLES	1			1	1			
RULES	1							
UNCER-TAINTY					1			

FIGURE III
Streams of Thought Matrix:
Miss Baker (2 lessons)

tic procedure would provide a much more reliable picture, were it based on several more stimulated recall interviews, but even here it can provide us with suggestions to be tested against further data. In interpreting this particular matrix, the "decision rule" adopted was that frequency counts of four and five were high enough to denote some trend of thought sequences over two lessons (17% to 22% of lesson events that stimulated sequenced thinking included instances of these particular thought sequences). A frequency count of three (13% of sequenced thinking instances) was not considered high enough to represent a trend in thought sequences, unless it involved a reciprocal sequence. Such a reciprocal sequence occurs in this matrix with three instances of movement from discussion of Teacher Reactions to Pupil Characteristics, and three instances of movement from discussion of Pupil Characteristics to Teacher Reactions.

Apparent patterns. Based on this procedure for analyzing Miss Baker's streams of thought, we arrive at an interesting description of mental connections among lesson elements. The most frequently used sequences show movement from explanation of a strategy of teaching to mention of a pupil characteristic (and vice versa), and from mention of a teacher reaction to pupil behavior to general evaluation of the lesson. The other common, reciprocal sequence involves movement from mention of a pupil characteristic to a teacher reaction to pupil behavior (and vice versa). In Miss Baker's mind, then, there appear to be fairly well-established connections between teaching strategies, pupil characteristics, and teacher reactions to pupil

behavior, and a further connection between teacher reactions and lesson evaluation. This is illustrated graphically in Figure IV.

Analysis of Imagery and Themes

The last, and in some ways the most interesting, analysis of the data from the stimulated recall protocols involves a look at teachers' use of imagery, and the recurrent themes this imagery reveals. It is this type of analysis that may be most revealing of deep-seated teacher beliefs. Once again we find strong differences between our two teachers.

An examination of Mr. Allen's imagery discloses two apparently contradictory, or at least non-complementary, themes. The first, and strongest, has to do with behavioral management. The second relates to instruction.

The imagery pervading Mr. Allen's comments about behavioral matters is that of a battle or power struggle between two opposing forces. Here are some sample comments:

That's just a good way to get them clammed up...I want them to fear that box, because when I say "Green box," I'm saying, "Be quiet."

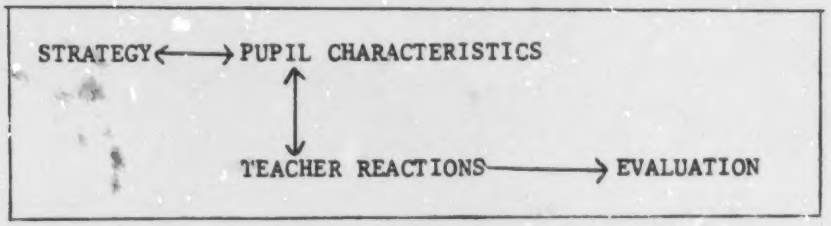
I just flat goofed...telling them they could fold up, because that got them out of the mood to study to begin with, and definitely you'd call that a tactical error.

...if it keeps on, I'll get her...Since that's the first time, we'll just cut her a little slack and keep the class moving.

I would have let that kid go ahead and write that (note) until I finished my lesson, if I'd thought I could still have caught him.

As long as I'm cool, calm and collected, that's going to worry him...No reason to get mad. I'm going to get that office behind me. If anybody's going to be mad, it's going to be him.

FIGURE IV
A Graphic Representation
of Miss Baker's Streams of Thought



I wouldn't have that kind of control over him, if the office wasn't behind me.

The metaphors used in these examples seem to imply that the teacher is engaged in combat (hand to seat) with his students, and the school administration, "the office," appears to be the reserve force that can be called in to back him up, when the battle is going poorly. This is not an uncommon metaphor for a teacher to use, but it does not seem to be well-integrated with Mr. Allen's imagery for instruction.

Actually, Mr. Allen makes very few comments about his instruction that utilize imagery, but in each case the imagery is supported by several other more explicit and related comments. The metaphors here highlight instruction as entertainment, and instructional strategies as devices to mitigate student boredom. The following comments illustrate this point:

Imagery:

Dan's repeating this class...He's heard this song and dance before.

Supportive Comments:

They're supposed to always bring their (materials) even if we are having a film, 'cause sometimes the projector breaks...What are you gonna do if you don't have a film (to show)?

I thought I was only doing fair to tell them that story.

Imagery:

Just any way I can get them to volunteer suits me...because your class is so dead without it.

Supportive Comments:

I thought it might be interesting to the children...The main

thing was to break the boredom.

...right here it (reprimanding a pupil) disturbs the class... which doesn't hurt to break up the monotony now and then.

...but you can wear anything out...like yesterday, I had them read on their own (instead of aloud to the class)...which I don't do often, but it's nice for a break...Because they can get bored with any of it.

Mr. Allen's "song and dance" involves periodic "story telling," and a weekly film, but this does not seem to dispel his explicitly stated belief that his instruction is essentially boring, in fact, boring to the extent that he is willing to interrupt the lesson for some disciplinary measure because it helps to relieve the monotony.

Thus, on one hand, Mr. Allen's metaphors depict him as a fairly effective classroom combatant, who is strongly supported by his reserve forces, while on the other hand, he appears as a song and dance man who is continually in danger of boring his audience to death. Mr. Allen's metaphors for teaching seem to be as disconnected as his thoughts about events in his lessons.

In contrast, Miss Baker uses the same imagery in discussing both behavioral management and instruction. The overriding impression is that of constant motion. In her metaphoric language, Miss Baker is always "moving on," and carrying the class with her, or even, on occasion, "riding" them. Here are a few examples:

They have to have a pass (to leave the room), but I don't like to stop and write one... then you lose your class.

Right here I'm feeling really short on time. I want to move on to something else...

Yesterday I had the class...in my hand a little better.

Today's class bothered me a little bit, because I had to keep... keep on the kids...I hate to keep riding on the kids.

I keep it rolling all the time, I'm always talking, I'm always going...I don't slow up, I don't pause very often.

Roy did look lost at that moment, and I thought, maybe if I pull him in...

I don't like to plunge into something and expect them (to know it) ...so I don't assume anything; I just start from scratch.

Miss Baker's metaphors suggest that, as she travels along, she relies on one basis steering mechanism, speed of students' responses. The following comments are illustrative:

They didn't snap back with the answers as quickly as I wanted them to...When kids pick something up...it's faster paced.

I felt they were picking up speed at that point, when I said, "Boy, you guys are getting it."

They were slacking off...I could see a little bit of fidgeting going on.

Another basic steering mechanism is revealed, not in metaphoric language, but in frequency of comments attesting to the importance of students' pleasure in their own participation or achievement. The following comments illustrate this emphasis:

They seemed to enjoy being called on and giving the answers.

...I think she was pleased with what she had done, and today she raised her hand...two or three times, so maybe she'll start feeling better about answering.

By saying what I said, it made Deswick feel fine, because he smiled...

I don't want (Deswick) to be totally unhappy. He was extremely upset (sitting) back there (in the back of the class).

Miss Baker's imagery fails to provide us with any sense of the

goal, or finish line toward which she is apparently moving. One comment suggests that she may be uncertain where the final "finish line" will be with regard to subject matter content.

> Last year, and in previous years, I've always liked to make up my lesson plans two or three weeks in advance, I just felt better about it, knowing where I was headed and where I was going. But now this year...I'm teaching a new grade...and I'm not real sure how much can be covered.

Miss Baker's imagery is consistent for both her role as behavioral manager and her role as instructor. She appears to be engaged in a race. At times it may be a horse race, and at times a swim meet, but speed is always of the essence, and she has a way to steer her course, though she may lack a clear sense of the mark she is striving to reach at the end. For the most part, Miss Baker's metaphors do not depict her as competing with her students in this race, but rather carrying them along with her. In fact, the impression we get is that she is not so much racing against any individual, as against time itself.

Composite Descriptions

When the results of these alternative types of analysis of the stimulated recall protocols are combined, it is clear that they tend to reinforce or corroborate each other, as well as to add descriptive detail. A composite characterization is presented for each teacher in turn. In each case, the information on cognitive processes is summarized first, then the image of the teacher derived from the metaphoric language is tested against other data to determine whether it provides a potentially useful representation of an implicit belief

chat might be held by the teacher.

Mr. Allen. To begin with, Mr. Allen is a singularly single-minded thinker. The categorical frequency chart shows his single, dominant focus on explaining his strategies of management (29% of his comments deal with this aspect of his lessons). This impression is reinforced by the fact that he exhibits almost no sequencing of thoughts in discussing lesson events. He has a single categorical focus for almost every single event. This single-mindedness is evident even when he expresses uncertainty, for he notes that although he is not sure whether his procedure is right or wrong, he follows it anyway.

The images of teaching revealed by Mr. Allen's metaphoric language are readily related to other data derived from the stimulated recall interviews. His stronger focus on strategies of management and response to school rules corresponds well with the image of teacher as an effective combatant in the behavioral battle, supported by the reserve army, which is billeted in "the office." The tone and content of Mr. Allen's categorized comments add corroborative detail here. He concurs with and supports school rules, and in turn feels supported by them. He characterizes pupils in isolation from himself, as any good soldier would, keeping a barricade between himself and the enemy.

Given his second, more negative image of teacher as an ineffective entertainer, faced with a perennially bored audience, it is perhaps not surprising that Mr. Allen makes no comments about his

reactions to pupils' instructional behavior. It is audience reaction to the entertainer that is important, not vice versa. Mr. Allen's comments on goals and lesson evaluation, which at first seemed merely vague, take on a new quality under the spotlight of this imagery. His goals are, in effect, to complete the entertainer's script, "cover these explorers," "get those pages read," "get those questions discussed," get that movie shown, get that story told. His evaluation is directly related to these goals; he gets accomplished what he "wanted to get accomplished;" that is, the script is played out. He shows little concern about providing for pupil participation when time pressures are felt. Completing the script is more important than audience participation.

Mr. Allen's implicit beliefs about teaching, then, may be usefully epitomized by these two conflicting images. Perhaps, because of this basic conflict, his mental life can only be maintained by careful compartmentalization of his thinking, by focusing on one idea at a time, by refraining from relating the various aspects of his lesson, or by refusing to associate the various characters that people his classroom.

Miss Baker. Miss Baker is at once more complex and more consistent in her thinking than Mr. Allen. Her categorical frequency chart shows a diffused focus, but there is an internal consistency in the diffusion. The three lesson aspects that she emphasizes most strongly (ranging from 13% to 8% in proportionate frequency of comments) are explanation of strategies of management, teacher reactions to

pupil behavior (management), and individual pupil characteristics (management). Three of the four lesson aspects that she emphasizes more strongly than Mr. Allen are content goals, evaluation of instruction or learning, and teacher reaction to pupils' instructional behavior. Thus she consistently considers several aspects of behavioral management, and several aspects of instruction, in thinking about her teaching.

Relatively more complexity and consistency are also evident from the analysis of her thought sequences. She frequently relates two or more aspects of the lesson in discussing a single event, and, what is more, a clear pattern of typical thought sequences emerges. Teaching strategies are related to pupil characteristics, pupil characteristics are related to teacher reactions to pupil behavior, and mention of teacher reactions to pupil behavior tends also to lead to comments about evaluation of the lesson.

Consistency is also apparent in Miss Baker's image of the teacher, as revealed by her metaphoric language. In both roles, as behavioral manager and as instructor, the teacher is depicted as racing along through the lesson, carrying her pupils along with her, and steering her course by noting the speed of their responses and the pleasure with which they participate.

This vision of teaching is also reflected in the tone and content of Miss Baker's categorized comments. She is specific and certain about her content goals for individual lessons, and she has more than one goal in mind for each lesson. She completes one goal, and imme-

diately begins pursuit of another, so that each lesson activity, as well as each lesson, can be seen as another leg of a relay race. In evaluating lesson management, she ponders as to whether too much time was wasted in transition from one activity to the next, or from one lesson to the next — in passing the baton, as it were. She complains about school rules and regulations that seem to place hurdles in her path, requiring her to slow the pace to take roll and write hall passes.

The image of the teacher carrying her pupils along with her in her perpetual motion machine, and steering her course by pupil participation in the lesson, is clearly reflected in the tone and content of Miss Baker's comments about strategies of management and pupil characteristics. Her comments on management strategies show strong concern about providing opportunities for pupil participation even when the pressure of time is felt. When she discusses pupil characteristics, it is almost always in relation to herself as teacher, and she comments on several occasions on changes (progress) in individual pupils, to which she feels she has contributed. Her sense of achievement as a teacher seems to stem from signs that her students take pleasure in their own accomplishments, enjoying the course they are traversing together.

Miss Baker's implicit beliefs about teaching, then, may be usefully epitomized by the image of continuous, mutual teacher and pupil progress toward a series of achievable short-term goals, progress that unfortunately is interrupted periodically by unwelcome requirements

of the central office (the time-keepers), or the unmet social needs of particular pupils. Her mental life is clearly not without conflict, but she exhibits some consistency, some complexity, and some degree of flexibility in her thinking.

The Value of Alternative Analyses

When we compare these final composite characterizations of teacher thinking to the original profiles proferred by the categorical frequency chart, the added richness of the descriptions is readily discernible. Already we have extra confidence in the validity of the descriptions, partly because the alternative approaches to analysis of the same set of data provide corroborative evidence of initial findings, but also because the initial findings have been fleshed out by the additional detail. We turn now to test these composite descriptions against evidence from other data collection procedures.

Kelly Repertory Grid Data

Method

According to Fransella and Bannister (1977), the Kelly Repertory Grid technique can best be understood as a type of structured interview designed to formalize a process for exploring another person's "construct system," a process in which, they assert, most of us are engaged most of the time, as we converse with and seek information about each other. The closer we come to understanding another person's construct system, the more we are apt to know about "the way the other person views (his/her) world, what goes with what for (him/her), what implies what, what is important and unimportant and in what terms (s/he) seeks to assess people and places and situations."

George Kelly (1955) believed that everyone tries to make sense out of the situations they encounter, and he devised the Grid technique as a means for examining the personal construct systems they used for this purpose. When this procedure is applied in studies of teacher thinking (e.g., Munby, 1982), the attempt is to understand how teachers make sense out of the instructional settings they encounter.

Data collection and analysis. Over the course of the fall semester three types of Kelly Repertory Grid data were gathered on the two teachers being considered here. The first set of interviews centered on teachers' views about their own teaching. Each teacher was asked to "describe what I might see if I visited one of your classes," using a series of brief statements. These statements were written down by the interviewer (on 3X5 cards) and were used as examples to be grouped, or categorized, by the teacher. The second interview focused on teacher perceptions of their pupils in the class that was being observed. Each teacher was asked to group students (names on 3X5 cards) according to the "things you have been observing about them since the beginning of the school year." The third interview dealt with teacher thinking about student misbehavior. Each teacher was presented with a set of examples of misbehavior (again on 3X5 cards) which had been gleaned from student handbooks in school districts in the surrounding area. In this interview both teachers were grouping the same set of instances. They were asked to put together those items that they thought belonged together, and to tell how they were similar.

In each interview, after the teacher finished grouping the elements being considered, s/he was asked to take each element (3X5 card) in turn, and rate its degree of association with each of the labels used for the various groups formed. Thus, even if a card was not originally placed in a particular group, the teacher could indicate that it had some association with the idea or characteristics on which that group was based. This procedure is designed to permit analysis of the relationships among categories generated by the teacher, or to capture the constructs (principles/beliefs) that organize teacher thinking. Factor analysis is used for this purpose, and the factors generated are checked with the teacher, and further explicated by the teacher in a follow-up interview.

Data from Kelly Repertory Grid interviews permit examination of a different slice of the teacher's mental life than stimulated recall data, and are worthy of detailed examination in their own right. In this instance, however, findings from analysis of these data are used primarily to test, corroborate, and elaborate findings from the stimulated recall interviews, since the purpose of this paper is to illustrate the process of integration of these data sets, not to explicate each in great detail. For this reason, the Kelly Repertory Grid data presented here include not only the teachers' identification of elements, categories, and relationships (in the teachers' terms), as would be the case in the typical analysis of these data, but also the researcher's identification of subcategories or superordinate categories present in the data, but not specif-

ically identified by the teacher, when these serve to test descriptions of teacher thinking derived from the stimulated recall data. It is hoped that these additional analyses will not be seen by other researchers more practiced in use of the Grid technique as a violation of the method.

The Building Blocks of Mr. Allen's Thinking

The single-minded thinker. The description of Mr. Allen as a single-minded thinker, derived from stimulated recall data, is reinforced in several ways by the Kelly Rep Grid data. In the Views of Teaching interview, he forms a large number of groups, most of which contain few elements, and many of which would seem to be quite obviously related to each other, though he does not draw such relationships. He clearly exhibits what Wallach and Kogan (1965) would call "narrow category bands."

A good example of this phenomenon is provided by a series of categories all dealing in some way with Texas History, the subject Mr. Allen teaches. Figure V presents all the categories formed by Mr. Allen, in the order formed, and indicates the elements contained in each. The categories which seem (to the researcher) to be related to Texas History are marked with an asterisk. Even when the factor analysis was performed, only three of these categories were shown to be associated with each other in Mr. Allen's mind. The "teacher's enjoyment of teaching" category was not positively associated with the other three categories listed here, but instead was negatively associated with the set of categories dealing with evaluation of stu-

FIGURE V
Categories Generated by Mr. Allen
on His "Views of Teaching"
(* = Categories Containing Elements Mentioning Texas History)

* "Teacher's Personal Feelings About Texas History"
teacher questions value of Texas history when it comes to making a living

"Grading and Evaluation of Students"
grade students by getting 8 or 9 per semester, dropping lowest grade
average students' grades
students keep a notebook - graded on content-one grade; second grade on neatness
teacher views "B" as average
most maps graded as 85's, which are really 75's
teacher makes up own tests
teacher's tests are multiple choice - 20 to 25 questions
tests are graded by students
first test graded with scanatron
students learn from grading their own tests - helps on Basic Skills Test
teacher justified in having students grading their own tests
review/drill students for a test
principals don't like students failing
personally feel that teacher is too lenient towards students grade-wise
students hear test questions out of the book and when teacher goes over them

"Discipline"
assign class questions to each row of students
students have to have their book, their notebook, and map colors every day
if students do not bring a book, notebook, or map colors the student needs to write a one-page essay
if student forgets essay, student writes a two-page essay or gets a lick
three-page essay if student talks when not appropriate
the busier you keep the students the less problems you have
three pages or a lick for talking when a student isn't supposed to
teacher wants students to be scared to talk

"The Way the Teacher Starts a Class"
introduce a topic by briefly discussing the topic (2-10 minutes)
students draw maps

FIGURE V
(continued)

"Dealing with Parents and the Public"
parents will not accept "C"

* "Teacher's Enjoyment of Teaching"
enjoy teaching, particularly Texas History
teacher has done some reading outside on Texas history for enjoyment and to help teaching
teacher cuts out newspaper articles on Texas history to use in class

"The Way the Class is Run"
announce an assignment by writing it on the board
have students read two sentences at a time
some students don't read loud enough for the other students to hear
questions in book are rephrased and teacher goes over them in class
calling on students always voluntary

* "Education of the Teacher"
teacher wishes he would have had more Texas history

* "Importance of Texas history"
Texas history shows problems in the past and how we solved them
most important events in Texas history were the Alamo, Battle of San Jacinto, and the Civil War

dents.

Other examples of the same single-minded thinking include Mr. Allen's formation of two small categories called the "way the teacher starts a class" and the "way the class is run." Both of these categories deal with classroom instructional procedures, but they are separate functions in Mr. Allen's mind. Under factor analysis, these two categories are associated with the larger category called "discipline," so at some level a relationship exists in Mr. Allen's mind, but the relationship is clearly not at the forefront of his thinking.

A final instance is provided by the category called "dealing with parents and public," which contains a single element, stated as "parents will not accept a "C" grade." This stands alone as a separate category, unrelated to the largest category he has formed, which is called "grading and evaluation of students." These two categories also are associated through factor analysis. Thus, while Mr. Allen has some sense of the relationship of this element to others dealing with grading, it is not an immediately obvious relationship to him.

Another way in which the Kelly Rep Grid data support the characterization of Mr. Allen as a single-minded thinker is the fact that in the second Grid interview he can think of only two possible ways of categorizing his pupils ("troublemakers" and "grades"). He finds only one real criterion for separating into categories the elements presented in the Student Misbehavior interview. His categories are "things the teacher would deal with" and "things dealt with in the

principal's office". Flexibility of concept use is clearly not a characteristic of Mr. Allen's thinking, according to the Kelly Rep Grid results.

Based on these findings, one is tempted to suggest that Mr. Allen has a number of identifiable, discrete categories which might form building blocks in his conceptual system, but that these blocks are not yet consciously related in his mind. One must question whether a "system" of constructs yet exists for Mr. Allen.

The effective combatant. The image of the teacher as an effective combatant in the behavioral battle, supported by the office "reserves," which was suggested by Mr. Allen's metaphoric language in the stimulated recall data, is reinforced in several ways by the Kelly Rep Grid data. To begin with, his second largest category in the Views of Teaching interview is labeled "discipline." Two of the elements in this category appear to be rather explicitly stated beliefs or principles of teaching. They are: "teacher wants students to be scared to talk;" and "the busier you keep students, the less problems you have." Four more elements detail punishment meted out: if students don't bring materials to class, they write a 1-page essay as homework; if they forget to write the essay, they are assigned a 2-page essay, or get 1 lick (paddle); a 3-page essay is assigned if a student talks when it's not appropriate; and a 3-page essay or a lick is given for talking when a student isn't supposed to (the distinction between these latter two elements is unclear). This category and its elements seem to support the view of

teacher and pupils as opposing forces in the classroom.

The supposition that this image of teaching as combat may reveal some of Mr. Allen's implicit beliefs is also reinforced by his approach to categorizing pupils. He really only forms one group of pupils, labeled "trouble-makers," and containing two pupils, Sam and Dan, whom we were introduced to earlier in his comments. He says, "as far as grades go...that's the only other thing to do...," but does not actually form groups on this basis, because he doesn't have his grade book with him. Thus, the impression we are left with is that the single item of information that he really knows about pupils is who are the troublemakers.

In categorizing examples of student misbehavior, Mr. Allen forms two groups: "things the teacher would deal with," and "things dealt with in the principal's office." This division of labor tends to support the view of "the office" as the repository of weapons to be brought into play as necessary. The fact that the teacher's list of things is longer than the principal's reinforces the idea that the teacher is viewed as dealing effectively with most skirmishes in this ongoing battle.

The ineffective entertainer. There is less direct evidence from the Kelly Rep Grid data to support the presumed image of teacher as an instructional song and dance man, than for the two descriptions of Mr. Allen's thinking discussed above. From one point of view, however, the elements in his "way the class is run" category, generated in the Views of Teaching interview, can be seen as details of the

lesson script, a script which rarely varies. These elements are: announce assignment by writing it on the board; have students read two sentences at a time (from text); some students don't read loud enough for others to hear; questions in the book are rephrased and the teacher goes over them in class; and calling on students (to answer questions) is always voluntary.

There is also an oblique reference to the boredom theme when Mr. Allen forms his "troublemaker" category for pupils. Of Sam and Dan, he says, "You can take them two (out of) that class and that would be another one you'd have to walk around in to stay awake..." Here the boredom extends to the teacher, and there is a suggestion that it is really the troublemakers who are the entertainers, engaging in antics that serve to keep the teacher from falling asleep in his own class.

Data from the Kelly Rep Grid interviews do not completely contradict the possibility that this image may reveal something of Mr. Allen's implicit beliefs, but they do suggest that it is a weaker characterization of his thinking than the first two cited above.

Spotlighting New Elements
In Mr. Allen's Thinking

Data obtained in the Kelly Rep Grid interviews serve to spotlight several new aspects of Mr. Allen's thinking that did not stand out sharply in the data from stimulated recall interviews. These new elements fit well within the framework of beliefs described so far, and illuminate them in important ways.

The role of pupil evaluation. The first new element that stands out is the place of grading and evaluation of pupils in Mr. Allen's thinking about teaching. "Grading and evaluation of pupils" is the largest category that he forms during the interview on Views of Teaching. At first glance, this category seems to bear little relationship to either the image of teacher as combatant or the image of teacher as entertainer, both of which we have supposed may reveal something of his implicit beliefs about teaching. A more careful look at the elements in this category, however, suggests otherwise.

Almost half of the elements in this category center around the theme of keeping grades up. These are: get 8 or 9 grades per semester; drop the lowest; average the student grades (after dropping the lowest grade); teacher views "B" as an average pupil grade: most maps pupils do are graded 85, but are really 75's; teacher reviews/drills students for tests; students hear the test questions out of the book, and when the teacher goes over them; and principals don't like students failing. This last element is the key. If student grades are not fairly good, the principal will be upset, so a variety of devices are used routinely to insure that students grades will be good. None of these devices are closely tied to student learning, only to student grades. Thus, student grading may be seen as an important factor in the behavioral battle, rather than in the instructional program. The principal will remain an ally only as long as student grades are kept up, or at least, this appears to be a supposition under which Mr. Allen may manuever.

Lack of awareness of pupils. There were hints here and there in the stimulated recall data of Mr. Allen's lack of awareness of individual pupils. This aspect of his thinking comes through much more strongly in the Kelly Rep Grid data. For one thing, although classes started in August, Mr. Allen did not know most students in his class by name when the pupil-categorizing interview was conducted in early November. He knows the two troublemakers, because he must identify them early, if he is to survive and win the classroom battle. (Of course, one of these two is repeating his class from last year, so he has had a year to get to know him.) Without his grade book in his hand, however, Mr. Allen cannot even identify students who are achieving well in his class in a general way. When pressed by the interviewer, he is able to name two girls who are "bright," and one boy who is "weak." "Other than that," he says, "it evens out pretty good," or to put it another way, he can make no distinctions.

Though perhaps disturbing to some observers, this blurring of pupils in Mr. Allen's mind is consistent with the image of teacher as an instructional performer, with students as the audience. What entertainer is ever sharply aware of his/her audience as separate individuals? They are merely a dimly-lit mass of transient humanity, regularly filling the space beyond the stage with their bodies, and occasionally filling the silences between lines in the script with their laughter. This is the way pupils seem to appear to Mr. Allen.

Knowledge of subject matter. There were a number of indications

in the stimulated recall data that Mr. Allen did not view himself as a conveyor of information in the classroom, but there was little to suggest why this might be so. At least a partial answer to that question is revealed in the data from the Kelly Rep Grid interview. As the statements in Figure V show, Mr. Allen wishes he knew more about Texas history, and his conception of it as a subject area appears to be limited to a listing of "important events." He has done "some outside reading" on the subject (unspecified here, but the book, Coronado's Children, is mentioned in stimulated recall protocols), and an important source of additional information that he brings to students in class is the local newspaper, out of which he clips articles. It seems clear that he does not view himself as knowledgeable in this subject area, and that he turns to materials written for the general public, rather than for specialists, in seeking information (stories) with which to supplement textbook fare.

Perhaps the traditional role of teacher as informant does not seem open to him, because of the limitations of his training in this subject matter area. Perhaps his view of the discipline of history, given this limited training, is the view from which the name was supposedly derived, that is, "his story." Stories that he reads in books, and stories that he reads in the newspapers, form the basis for the stories that he tells in class. The teacher as storyteller (entertainer) may be an image that accurately reflects Mr. Allen's level of understanding of the study of history.

Reconstruction

None of the data obtained from the Kelly Repertory Grid interviews negates any aspect of the description of Mr. Allen's thinking about teaching, as derived from the stimulated recall data. In a variety of ways, these new data reinforce and extend our initial attempts at understanding the cognitive processes and beliefs of this teacher. The reconstructed description which results is much more solid because it now rests on two strong data bases.

Complexity and Consistency as Cornerstones In Miss Baker's Thinking

Complexity of concepts. The description of Miss Baker's thinking about teaching as displaying a certain degree of complexity, a description derived from the stimulated recall data, is supported by several items of information provided by the Kelly Repertory Grid data. To begin with, she organizes the elements generated in her Views of Teaching interview into a few fairly large categories, which include varied types of ideas or topics within them. This demonstrates the fact that she has "wide category bands" (Wallach & Kogan, 1965), or that her categories are fairly complex. Figure VI presents these categories and their elements, to illustrate this point. Note that the "relaxed atmosphere" category contains elements dealing with management (pupils jumping up, shouting answers), instruction (pupil doesn't give right answer), school rules (gum chewing), and teacher-pupil relationships (teacher and pupils like each other).

FIGURE VI
Categories Generated by Miss Baker
On Her "Views of Teaching"

"Relaxed Atmosphere"
relaxed atmosphere
pupils sit around teacher's desk
pupil responses, everyone answers
pupils jumping up, shouting answers
need to go over assignment 2,3,4 times
tell pupils to be patient
pupil doesn't give right answer
don't give much homework
paper on floor
gum chewing
never see paddling
teacher shows pupils she cares
teacher and pupils like each other
teacher doesn't put pupils down

"Variety of Activities"
variety of activities
teacher trying new things
lessons going on in classroom
never finish class early
teacher talking
pupils write paragraph everyday
pupils read in front of class
pupils figure it out for selves
shift from teacher grading essays at home
peer grading

"Routine Things"
having students write every day
teacher assigns one lesson a week
quiet written work
a neat classroom

"Negative Things"
students don't listen
won't see sleeping, bored pupils
pupils don't get homework back to teacher

Another indication of a degree of complexity in her thinking is the fact that "variety of activities" and "routine things" were combined in a single factor, when the factor analysis was performed. Thus she apparently sees some relationships between the elements of routine and variation in her classroom.

Even more convincing evidence of some complexity in her thinking (flexibility of concept use), perhaps, is the variety of ways she generates to characterize her students, and to categorize the elements in the Student Misbehavior interview. Twelve different categories are used to group students, in sharp contrast to Mr. Allen's single category. Miss Baker's categories are: quiet, shy; self-motivated, independent; good grades; enjoys school; wants good grades and worries about grades; carefree about studies and more interested in social life than grades; opinionated, verbal, likes to be noticed, sharp; frequently seeks attention of teacher; motivated, school-wise; tries very hard academically; bright, but not good at English; and will go to any length to get attention. Miss Baker is clearly aware of a variety of social and academic characteristics exhibited by her students, which can affect the progress of her lessons. Furthermore, she is aware of the relationships among these categories, at some level, for the factor analysis results in four factors, dealing with motivation, attention-seeking, effort, and language facility.

Eight different categories are used to group student misbehaviors. These are: deal with light-heartedly; inhibits learning; serious

problem/causes harm; bothers me a lot; happens because student feels indifferent, disinterested; happens because student wants attention; happens a lot here; and caused by lack of family control or personal problems experienced by the student. Here Miss Baker is attending to several different aspects of student misbehavior, including probable causes, effects on instruction, frequency of occurrence, and her own feelings about these infractions. Again, she reveals some sense of the relationships among these various categories, for the factor analysis identifies three factors, which deal with teacher feelings regarding the seriousness of the offense, teacher attribution of causes of the behavior, and teacher's sense of the frequency of occurrence.

Compared to Mr. Allen, Miss Baker appears to be an exceedingly complex thinker as she deals with the elements of classroom instruction and management. A word of caution may be in order here, however. While Miss Baker is clearly the most complex thinker in this "sample" of two teachers, if she were located in a larger group, she might well appear to be only moderately complex. We must be somewhat guarded in our assessment of this characteristic.

Consistency of roles. The stimulated recall data pointed up the consistency with which Miss Baker attended to both her managerial and instructional roles, and the way in which these roles seemed to be integrated in her thinking. This finding is also reinforced in several ways by the Kelly Rep Grid data. The inclusion of both managerial and instructional aspects of classroom atmosphere in her

category "relaxed atmosphere," in the Views of Teaching interview (see Figure VI), is one indication of the integration of roles. Another indication is the inclusion of a category called "inhibits learning" in the Student Misbehavior interview. Finally, as noted earlier, her categories to describe student characteristics include both instructional (good grades; motivated; etc.) and managerial (seeks attention) aspects of student behavior. It seems clear, therefore, that Miss Baker routinely ties instruction and management together in her thinking. Even when asked to focus solely on behavioral management, she notes the relationship of this aspect of teaching to instruction, or student learning.

Running the good race. The image of the teacher racing against time, carrying students along toward an attainable, short-term content goal, hampered by office hurdles or attention-seeking students, and steering her course by the speed of student responses and the pleasure students gain from their participation in the lesson, an image suggested by Miss Baker's metaphoric language in the stimulated recall data, is substantiated in several ways by the Kelly Repertory Grid data. The pell-mell progress of lessons does not come through strongly, but two of the elements in Miss Baker's Views of Teaching interview include some sense of urgency in the pace of lessons (pupils jumping up, shouting answers; never finish class early). The concern with interruptions caused by attention-seeking students comes through very strongly in these new data. Two student characteristics categories (frequently seeks attention of teacher; will go to any

length to get attention) and one student misbehavior category (happens because student wants attention) focus on attention-seeking behavior of pupils.

Even more evident is the sense of impatience with school rules that would take time from instruction if she were to enforce them. The elements Miss Baker includes in her category "deal with lightheartedly," in the Student Misbehavior interview are very revealing in this respect. They are: not following dress code or grooming code; gum chewing; loitering in the halls; tardy entry to class; littering/leaving waste paper on the floor; bringing a radio or tape recorder to school; being out of one's seat in the classroom; writing or passing notes; and reading or working on an inappropriate task. Most of these misbehaviors are infractions of office-imposed rules, which Miss Baker deliberately refuses to enforce. Note that her list of things we would see in her classroom (Figure VI) includes "papers on the floor" and "gum chewing."

The importance of pupils' eagerness to participate in the lesson, as a steering mechanism for the teacher, is also evident in the Kelly Rep Grid data. "Enjoys school," "motivated," and "tries hard" are categories used to describe student characteristics. Among the elements noted in the Views of Teaching interview are: pupil responses, everyone answers; pupils jumping up, shouting answers; tell pupils to be patient; pupils read in front of class; and won't see sleeping, bored pupils.

Several pieces of information from the Kelly Rep Grid interviews,

then, tend to reinforce certain aspects of the image of teaching suggested by Miss Baker's responses in the stimulated recall data. The aspects of this image that are not strongly reinforced by the new data are the sense of racing against time, and of carrying students along. These aspects are not negated by the new data, however, so they still stand as plausible elements of the image.

Additional Impressions Derived from New Data

Several characteristics of Miss Baker's thinking about teaching, which were merely hinted at in the stimulated recall data, stand out as much more important on the basis of data obtained through Kelly Repertory Grid interviews. These features add new depth to the description of Miss Baker's thinking.

The primacy of instruction. Data from stimulated recall interviews suggested that management and instruction were almost equally important to Miss Baker, but data from the Views of Teaching interview suggest otherwise. The whole category of "variety of activities" deals with instructional aspects of the lesson, and instructional aspects are included in the "relaxed atmosphere" and "routine things" categories as well, so that overall, more instructional elements are mentioned than behavioral management ones. It is also worth noting that, of twelve student characteristics categories generated, eight deal with instructionally-oriented characteristics, and only two with clearly behavioral management characteristics. Based on Kelly Rep Grid data, instruction takes on a more dominant position in Miss

Baker's scheme of things.

This does not imply that Miss Baker is a remarkably effective instructor. In fact, many of the elements she mentions in reference to classroom management suggest that her "relaxed atmosphere" may interfere with the instructional process (e.g., pupil responses, everyone answers; pupils jumping up, shouting answers; need to go over assignment 2,3,4 times; students don't listen; pupils don't get homework back to teacher). It is the case, however, that in describing her views of teaching and her pupils, Miss Baker focuses more on instruction than on management.

The importance of pupils. Pupils were certainly not ignored or forgotten in Miss Baker's reports of her thinking about teaching during stimulated recall interviews. However, they did not seem to dominate her thinking. References to pupil characteristics and teaching strategies were evenly balanced, and comments about teacher reactions to pupil behavior were only slightly less frequent than these two lesson aspects, so teacher activity and pupil activity seemed to be emphasized about equally. In the Views of Teaching interview pupil activity holds a much more dominant position. Thirty-one elements are generated in this interview, to describe what goes on in Miss Baker's classroom. In ten of these elements, pupils are the clearly designated major actors (e.g., pupil responses, everyone answers; pupil doesn't give right answer; pupils write paragraph every day; pupils figure it out for themselves; students' don't listen). In four of these elements, the teacher is the clearly

designated major actor (e.g., teacher trying new things; teacher talking; teacher assigns one lesson a week). In five elements some relationship or interaction between teacher and pupils is clearly specified (e.g., teacher shows pupils she cares; teacher and pupils like each other; pupils don't get homework back to teacher). Several other elements imply some relationship or interaction, though they do not specify both actors (e.g., need to go over assignment 2,3,4 times; having students write every day). In this description of her teaching, pupils and the relationship of teacher to pupils seem to dominate Miss Baker's thinking. With regard to relationship of teacher to pupils, liking and being liked by pupils is clearly important.

Some of the elements noted above suggest that Miss Baker is "carrying students along" with her in the lesson, but some of them indicate that students may be seen as moving under their own power, albeit on a track laid out by the teacher. Several of these elements extend our understanding of the importance of students' happy participation in lessons, as a steering mechanism for the teacher. "Happy" students may be interpreted as "students who like their teacher." Perhaps this is the real long-term goal toward which Miss Baker is pointed. Perhaps management strategies that provide a "relaxed atmosphere," where "gum chewing" and other onerous school rules are not enforced, may be viewed as ways of insuring that students will be happy participants in this classroom, and that the long-term goal of "being liked" will be achieved. These data tend

to reshape our vision of the relationship of participants in the instructional race depicted by Miss Baker in her descriptions of teaching.

The rejection of school rules. Miss Baker was clearly not a strong supporter of school rules, according to the stimulated recall data. She commented particularly on her aversion to taking roll and writing hall passes, because this interrupted the pace of the lesson. Her dismissal of many school rules as things to "deal with light-heartedly," which is revealed in the Kelly Rep Grid data, however, adds a new dimension to our understanding of her thinking.

There is an essential contradiction in Miss Baker's thinking about behavioral management. It is true that she imposes few rules on students in her own classroom. She seems to accept writing notes in class, calling out answers, and moving around the classroom during writing periods, cheerfully seeing such activities as characteristic of her "relaxed atmosphere." There are at least two rules which she does care about, however, according to the stimulated recall protocols. The first is "don't interrupt the flow or slow the pace of the lesson." The second is "don't hurt the feelings of your classmates." She becomes visibly upset when either of these rules is broken (evidence from stimulated recall).

Miss Baker appears to be totally unaware of the fact that she is daily modeling for her students her own disregard of the rules that she herself is expected to follow. She openly ignores or circumvents rules that are known to the entire school community, be-

cause she does not wish to take the time to enforce them. In the process she demonstrates her belief that the inclinations of the individual take precedence over the requirements of the group. Yet she wonders why some of her students follow their inclinations, and disregard her rules. Miss Baker sees many connections between pupil behavior and her own teaching strategies, but this is one connection that she has yet to draw.

Course Corrections

On the basis of the Kelly Rep Grid data, our vision of the race course on which Miss Baker and her pupils may be seen to take their daily exercise has undergone some important adjustments. Pupils are viewed as more active participants in the race, and at least some of them are now seen to be self-starters. The course itself seems more narrowly circumscribed, focused more on instruction, and on keeping students happily involved, liking not only the process, but their teacher as well. The course also appears to be separated from the surrounding scene to some degree, so that runners here are guided by a different set of limits than those who take their exercise elsewhere in the community. The new data have sharpened our depictions of the image that may reveal Miss Baker's implicit beliefs, but the essential elements still hold.

Ethnographic Descriptions of Classroom Interaction

We turn now to examine a third set of data, to further test the already revised descriptions of these two teachers. Our focus shifts

to the observation of interactive behavior through ethnographic field notes.

On all occasions when lessons were videotaped for purposes of stimulated recall interviews, an observer was also in the classroom writing an ethnographic description of the classroom interaction. Ethnographic observations were also conducted at times when lessons were not being videotaped. Over twenty lessons were observed for each of these two teachers over the course of the fall semester. The observer's field notes were written up as full classroom protocols, and these form the basis for the analysis of classroom interaction data. For purposes of this paper, examples of interaction will be drawn from classroom protocols for the four lessons on which the stimulated recall data discussed earlier were based. An examination of the other classroom protocols indicates that the interaction in these four lessons is fairly typical for both of these two teachers.

The data provided by the classroom protocols are extensive, and could easily be used as the sole basis for a paper comparing these two teachers. However, the focus of this study is on teacher thinking, and the behavioral data are used here to substantiate, explicate, and evaluate descriptions of teacher thinking derived from the other two data sources. Teachers, like other humans, may not always behave in ways that are consistent with their beliefs. On the other hand, their behavior may help us to understand their beliefs more completely.

Mr. Allen Acts the Part

Essentially, the interactive data on Mr. Allen's classroom corroborate our conjectures about his implicit beliefs. In particular, they provide us with a clearer understanding of how the image of teacher as entertainer may provide insights into his classroom practices.

To begin with, the role that evaluation and grading play in Mr. Allen's thinking about teaching are highlighted in the interactive data. It is clear that the test, which will be taken eventually, is the major point of the class activity, and that repetition (memorization) of the information to be covered by the test is the process by which Mr. Allen expects students to learn their "lines." Several segments of interaction in the classroom protocols illustrate this point. (All student names have been changed in this presentation. Otherwise, the segments are direct quotations from the ethnographic transcripts.)

The students have read up to a point in the book where questions start. Mr. Allen then says, "Briefly describe. People, you will need to be able to do this. Describe these explorers, because they will be on the test questions. You better know them. Okay?"

An Anglo female reads the next section. Mr. Allen then begins to read the questions for this section, asking first, "What was a Spanish presidio?" Mr. Allen responds before a student gives the answer, saying, "A small fort." The student who was called on to answer continues to read the answer from the book, "It was a small fort..." Mr. Allen cuts the student off, saying that "small fort is enough," so the student echoes this preferred answer.

Mr. Allen interrupts a reader whose first line is, "Also shown are the most important towns of Spanish Texas: Goliad, Laredo, Nagodoches, and San Antonio," to locate these towns on the map of Texas hanging at the front of the room. Mr. Allen takes his pen

out of his pocket and points to each of these four towns on the map while repeating their names. He does this twice.

The basic pattern of classroom interaction revealed in the classroom protocols is to read aloud (two lines at a time) a section of the textbook, answer aloud the questions at the end of that section (which will be the questions on the unit test, as well), read the next section, answer those questions aloud, then write (in notebooks) the answers to the questions that have just been answered aloud. This pattern is repeated class after class, day after day, with regular breaks for a weekly movie (usually unrelated to the topic being covered in the textbook at that point), and the periodic tests. A test is usually preceded by an oral review of the questions to be asked.

In a sense, the textbook provides the "script" for the lesson, and it is a script that is quite closely followed by both teacher and pupils. The pupils read their lines from this script, review them several times, and eventually "perform" them on the unit test.

At times Mr. Allen ad libs within this script, in order to tell a story. In these instances he takes center stage.

Coronado came along and got the word from DeVaca that there were seven cities of gold. So Coronado is going to come over here and find the seven cities of gold. And he runs across an Indian. This Indian, they call him Turk. I don't know why they called him Turk. I do know there was a lot of wild turkeys back in those times. Whether that had anything to do with it, I don't know. Turk kept saying, "A little further, a little further. A little further, on up ahead," and that went on for days, months, months moved into years, and finally they one day just hauled off and haw! (the "haw" is illustrated by a chopping motion of the hands from Mr. Allen.) They killed that Turk. Turk had a good time leading them all over the place. That Turk probably never saw any gold.

Some of Mr. Allen's stories show a lack of sensitivity to certain groups, such as Indians and females.

Here you are, a happy Indian, sitting around beating your drum all day. Then you get to go hunting if you live in the western part of the state, and in the eastern part of the state, you're going to fish all the time. If you're an Indian. And if you catch a fish in east Texas, your wife cleans it. If you go out hunting, kill a deer in west Texas, your wife's gonna clean the deer. 'Long come the Spanish. "That's not right. You're not supposed to do that. Wife is not supposed to work that hard." I think I would have made a great Indian. (Students laugh in response, and Sam says, "Me, too.") Boy, I'd have me that woman washing them dishes. Nice to have a dishwasher around the house. Anyhow, Indian women in most tribes did all the cooking, prepared all the game, ground all the corn, and all that kind of stuff. Planted the crops, and that kind of thing. It was great for the Indian man. He just sat around and kind of supervised.

This apparent insensitivity to the feelings of others is also evident in certain comments to individual pupils.

Mr. Allen walks over to Dan and tells him that "you need to put your head down and act like you know what you're doing."...He then continues talking to Dan saying something about "you need to get you a girlfriend." This provokes laughter from the other students.

Mr. Allen calls on Ellen, who says she doesn't know the answer. Mr. Allen responds, saying, "You poor thing. Look it up."

Mr. Allen asks that one student read the entire next section. He requests a "loud mouth." An Anglo female reads.

Mr. Allen says to Sam, "You have an IQ of zero. I think you're a pretty smart boy. There's just no demand for your type."

These kinds of comments to pupils may be issued for their entertainment value, in much the same way that Mr. Allen's stories seem to be. They also seem to be associated with a general lack of awareness of pupils as individuals. At several points in these lessons Mr. Allen demonstrates to students that he doesn't know who they are.

Mr. Allen identifies most of the students by pointing at them to answer the question, or saying, "Right here, the boy in blue."

Gavino comes up to the desk (to get his report card) and Mr. Allen asks him, "What's your name?"

Molly Anderson wants to leave the room, and Mr. Allen asks her what her name is. She replies, "Molly," and Mr. Allen says, "Molly What?"

Mr. Allen is busy writing Sam's offense down, and the punishment, for placement in his little "green box."...Mr. Allen asks Sam how to spell his last name.

This lack of awareness reaches an extreme when a new boy enters the class. The following exchanges take place during the first morning he is in attendance.

A new student comes up to Mr. Allen's desk, and Mr. Allen says his name questioningly, "Larry Hellman?" and writes it down on his roll sheet..."What do your folks do for a living, Larry?" Larry appears stunned by the question, and replies, "Do what?" Mr. Allen repeats the question. Larry replies, "My mom works in a hospital and I don't know what my dad does. They're divorced." Mr. Allen repeats, "Divorced?" and the student replies "Umhum. I don't know where my dad is." Mr. Allen then begins to tell the new student the supplies he will need for class.

When the reading order (round robin reading of the textbook, two lines at a time) comes around to the new student, there is a pause, because the new student appears not to understand exactly what is expected of him. Mr. Allen asks him, "Can you read?" and the student replies, "Yes." So Mr. Allen tells him to "Go ahead."

Students are noisily putting their books up and getting their notebooks and pencils out...Mr. Allen walks to the back of the classroom and tells the new student, Larry, "You need to go to work when I tell you. Oh, you don't have a notebook, do you?" Mr. Allen then walks away from the new student and leaves him with nothing to do.

This lack of awareness of and sensitivity to students, which seems to pervade Mr. Allen's interaction with his pupils, is only exceeded by his own apparent boredom with lesson activities.

Mr. Allen is fidgeting around at his desk while following the

readers in the book. He is closing a desk drawer, or rather, trying to close a desk drawer with his knee, and is making a lot of squeaking noises.

When it comes time for Dan to read, he doesn't know the place. Another student shows him where to read. Mr. Allen is piling up things on his desk to create a podium for his book to rest on.

The students have now finished reading. When a student hesitates, Mr. Allen says, "Next reader." The students have read up to a point where the questions start.

Kenny reads from the book. Mr. Allen is yawning while the student is reading the answer.

(Students are beginning to write in their notebooks.) Mr. Allen looks at his watch, walks a little across the front of the room, and says, "Get busy." He is now pacing across the room and coughing a lot...The students are still making a fair amount of restless noises... Mr. Allen is still pacing across the front of the classroom. He has looked at his watch again.

The boredom that Mr. Allen seems to feel during the routine instructional activities is in sharp contrast to the pleasure that he exhibits during interaction associated with behavioral management.

The students are looking up the answers to the questions in the book. Most students seem to be on task...Mr. Allen says to Sam, "What you writing?" Sam replies that he is answering the question. Mr. Allen then says, "Let me see," and holds out his hand for the paper. The students in the class begin to laugh...Sam finally hands it to him and Mr. Allen begins to read it, smiling...Mr. Allen appears to be exaggerating his reading motions for the benefit of the students...After Mr. Allen finishes tearing up the note, he says, "All right, Sam, I believe I have you. You like to write so well..." He says this with laughter in his voice, as he thumbs through his little green notebook." I believe you like to write so WELL, I'm going to put you down for one sweet little page on why you're not going to do that anymore."

(Students are working on their notebooks, toward the end of the same class in which the above incident occurred.) Mr. Allen is pacing across the front of the room...As he nears Kenny, Kenny says, "Mr. Allen." "Yea?" "What time is it?" Mr. Allen replies, "Daytime," which is met with laughter from the class...Mr. Allen looks at his watch, and Kenny says, "12:48 - time to go?" Mr. Allen replies, "I ain't gonna tell you." Sam speaks out, saying, "Two min-

utes." This is followed by Mr. Allen addressing Kenny, saying, "if you don't get busy - you broke the whole class after you said that. They's at work and you pop off. Didn't even raise your hand or nothin'." Kenny says, "We got two minutes to work?" Sam replies, "That's right." Mr. Allen then says, "You got about two minutes, I'm going to paddle your tail. Come here." Kenny replies, "Me?" and Mr. Allen says, "Yeah." He is walking toward the door..."I'll give you one lick...should get three for that."...I hear a loud bang. Kenny comes back into the classroom with a very red face, but a grin on his face. Mr. Allen follows, saying to the class, "You can fold up your books now." Mr. Allen has a gleeful smile on his face, which he directs at Kenny immediately after he says this. He follows this by saying, "Whooooooooo."

These behavioral examples of Mr. Allen meting out punishments with such apparent enjoyment modify our interpretations of the image of teacher as combatant. These skirmishes with students do not appear to be serious battles to Mr. Allen. They seem more like "war games" than the real thing. They appear to entertain both Mr. Allen and the class, except, perhaps, the students who are directly engaged in them, and even they seem to approach the interaction with a certain air of playfulness.

Taken all together, the behavioral data reinforce the importance of the image of teacher as an instructional entertainer. The script to be memorized, the stories to be told, the laughter to be shared, all support this image. In fact, it now appears that the entertainer image may reveal a hitherto undetected aspect of Mr. Allen's behavioral management role as well, for here he seems to be engaged in mock battles. Perhaps Mr. Allen's image of the teacher has an essential unity after all. The behavioral data suggest that he entertains his students with stories, and he entertains both himself and the class by catching and punishing errant students, in order to en-

liven the rather boring script that they are all required to act out.

Miss Baker Hops the Hurdles

Our conjectures about Miss Baker's implicit beliefs, developed from two sets of data on teacher thinking, are also substantially supported by the data on classroom interactive behavior. The new data, however, reshape our understanding in important ways. As we see Miss Baker's progress along the race course through a new set of binoculars, we note how she hops over some hurdles, and runs around others. Most importantly, we realize how her apparent complexity of thought causes her to create hurdles for herself, hurdles which may eventually trip her up.

Miss Baker's need to keep the lesson moving, or to keep pupils moving along the lesson track, is evident in several instances of classroom interaction.

(At 12:08, three minutes after the tardy bell has rung) Miss Baker finishes calling the roll, draws students' attention to a poster on the board, and announces, "Okay, on the board in front of you, you'll see a picture of E.T.....Now let me explain what I want you to do..."

Miss Baker shushes the class and reminds them they have only ten minutes to get down as much as they can (in their journals).

Miss Baker says to the class, "Okay, most of you are just about done. Keep writing, but what I want you to do is re-read it to yourself..."

Miss Baker addresses the class: "Okay, everyone have their homework out? If you don't have your homework finished, you certainly better fool me and quick get it down. It's not going to take you that long, and you're not going to learn anything by just sitting there. So quickly start writing as we go along."

In addition to these continued exhortations to students to keep moving, keep busy, Miss Baker keeps the lesson going until the very

last minute.

Miss Baker calls on Jason to do number 9 (in the punctuation exercise). As Jason begins to read, Deswick calls out, "Comma," wherever there should be one. Jason is also noting where the commas should be...When Jason finishes, Miss Baker tells him that he had all the right commas, but that he added one after "anything," and "I don't see any rule for that." Deswick and other students have put their things away and are ready to leave. Miss Baker now asks Jason for the rules governing the commas he inserted. "I don't know, Miss," he says. "Look for it," Miss Baker replies. Cal has his hand up. "I'll give you a big hint," says Miss Baker, "It's on page 10." Jason calls out, "Eight." Others suggest, "Nine." While he's still looking, the bell rings and everyone runs out.

In order to keep the pace going, Miss Baker circumvents many hurdles that might slow or interrupt other teachers. She doesn't stop to give hall passes, and she ignores or tolerates several instances of off-task behavior, while she interacts with individual students.

Gabriel gets up out of his chair and goes to Miss Baker at the front of the room. He says that he's left his journal in his locker. Miss Baker allows him to go get the journal, but doesn't give him a hall pass.

"Okay, when you get this done," Miss Baker begins, addressing the class, "Get out your homework..." The noise level increases. Frank says, "Oh, no, Miss Baker." He goes up to tell her that he's forgotten his student handbook. She lets him leave the room to fetch it. Again, she doesn't give out a pass.

(Miss Baker has just assigned a descriptive paragraph on E.T. for the day's journal writing, and answered several questions from students, clarifying the task.) "Anybody else," says Miss Baker. There is still considerable talking going on. I notice extended conversations between Frank and Stella, Dallas and Cal, and Angel and Estralita... There are still few students working on the journal, though I suppose it's possible that some of the conversations have to do with the task...Miss Baker spends a few moments looking at something on her desk, then gets up and begins walking up and down the aisles, (looking at students' papers)...Stella wads up some paper and gets up to throw it away... Manny gets up and sharpens his pencil. Miss Baker is now at Clark's desk, looking at his paper. She works her way up the aisle, looking at Ralph's paper next, then

Cal's...Stella, who's torn up several sheets of paper, prods Frank and says something. They're really talking quite a bit. Miss Baker is now talking to Sue, then Samantha.

In addition to tolerating some off-task behavior, Miss Baker seems almost to welcome interruptions and calling out by students when these are content-oriented, since she responds with positive reinforcement.

(Miss Baker is giving directions.) "Write a paragraph about this character (E.T.), using many adjectives...Tell me who he is, what does he look like, what is his size, color, texture of his skin, eyes, and any special features." Dallas breaks in here to ask, "How you gonna know the texture of his skin when you can't feel him?" "Right," says Miss Baker, "You have to use your imagination.

Jeremy is well prepared and does #4 (punctuation exercise) perfectly, without any hesitation. "Perfect," says Miss Baker, "How many got that right?" Miss Baker then repeats what Jeremy has said and elaborates on the rules governing the use of the commas...For the second comma, she explains that it's the comma that goes before the conjunction joining two sentences. She asks what the conjunction is, and several students answer, "And,"...Deswick calls out, "The conjunction is 'and'." "That's right," says Miss Baker, "The conjunction is 'and'. Good, Deswick."

While Miss Baker slips around some of these behavioral management hurdles, she seems to take many of the instructional hurdles in stride. They may slow the pace slightly, but they add to the sense of accomplishment at the end.

Miss Baker takes the pencils out of the hands of Sue, and then Samantha, and writes something on their papers...She stops at Danny's and Dougal's desks and takes their pencils, and writes something on their papers. [Later, in the stimulated recall, she reported that she was correcting spelling here, without interrupting the writing process unduly.]

Miss Baker is looking at Manny's journal. He has apparently underlined his nouns instead of his adjectives. Miss Baker tells him to just go ahead and circle the adjectives...She explains to Manny that nouns "name persons, places, or things. You need to find the words that describe the nouns."

(Cal is doing # 1 in the punctuation exercises.) "Okay," says Miss Baker, "You decided to put a comma after twins. Why?" I think Cal says, "Six,"..."Rule number six, Cal. Read rule number six for me."...Cal reads..."After other introductory clauses." "Introductory clauses," says Miss Baker, "Do you know what introductory clauses are...Let's get that in our minds first, before we go on trying to say 'after introductory clauses'."

"Now independent clauses are just like the word indicates: independent. What is it when you're an independent person?"...Stella answers, "Somebody who can support himself."..."An independent clause can stand all by itself. It doesn't need help...Now a dependent clause is exactly what the word indicates. Dependent means what? Can't do much by yourself, you depend on other people. Are you a dependent person or an independent person?" Miss Baker asks. Most of the kids answer, "Independent,"..."Independent means you can stand all by yourself, you can do it yourself. And that's what a sentence does. It stands by itself. It doesn't need any help."

In the above instances Miss Baker is seen to be taking time to make sure that students understand the ideas being dealt with. She appears to be concerned with learning, not just task completion, and she handles these instructional hurdles with comparative ease. She also recognizes and copes with the hurdles erected by individual pupil differences.

Miss Baker calls on Estralita for #8 (punctuation exercise). Estralita does it okay, except she forgets the commas bracketing "M.D." (rule 13). She's used to being right and has an amazed expression on her face when Miss Baker tells her that she left two commas out. Miss Baker directs her attention to rule 13 and lets her correct herself.

"Okay, Jason, I want to see you do number 9," Miss Baker says. "You seem to be kind of, not real sure." "Oh, no," Jason groans, "I'm not." "Well, that's all right," says Miss Baker. "We'll practice, we'll learn. Number nine." ...At one point Jason falters and Miss Baker says, "Jason, would you put a comma there or not?"..."Yes," he says.

In addition to the hurdles that classroom circumstances have placed in her path, Miss Baker creates a few hurdles for herself. These may stem from her tendency to engage in more complex thinking.

She seems never to be satisfied with accomplishing one goal when she can devise a way to accomplish two at one time. It is typical of all her lessons, for example, that at least two different activities are planned and completed. Even within a single activity she may strive to achieve a dual purpose.

"Outlines are important, and I want you all to know how to do them correctly. Tomorrow I have two full handouts to give you, and I think it gives you a pretty clear idea of how to go about it. And if your history teacher hasn't told you--I talked to every history teacher on down the line, and they will be giving an assignment in your history book so that you will be doing outlines for them as well as for me." There are moans from several of the students. Miss Baker keeps speaking over the noise and comments from the students. "Your outlining will serve a dual purpose here...History is one of the easiest books to outline, I think, because your history book is set up pretty--they're set up in a nice order, and it's pretty easy to see how to outline them in detail."

It is precisely Miss Baker's dual-purpose instructional goals that create the hurdle which trips her up with Deswick, the one student who really "gets her goat." Her intentions are to keep the pace/flow of the lesson moving, and to keep students feeling good about their participation in the lesson. These are the guideposts she uses to evaluate her instruction. Deswick is only happy when he is the center of his classmates' attention, and he can apparently only accomplish this by interrupting the flow of the lesson. Thus it is impossible to keep Deswick happy and maintain the flow of the lesson at the same time. Miss Baker tries a variety of strategies with Deswick, in her attempts to leap this hurdle, but in the end it is insurmountable.

"All right, now," Miss Baker says, and pauses, "Yesterday I told you how to put things in order, and you have to be real specific with

your directions, and if you aren't, you're not going to sound clear enough, okay? And we demonstrated that with the blocks. You gave directions to the person behind you - Deswick wasn't here - we had two people up here at the front. One person here, and one person here." Miss Baker demonstrates physically the placement of the two students in the activity...There is some other talking going on as Miss Baker explains what went on yesterday to Deswick.

After reading Frank's paper silently, Miss Baker says to the class, "People, don't forget punctuation...After each one of these sequence words, use commas. For instance, you would use - "First, comma, you get a bowl from the cupboard. Second, comma, get out your tomatoes, period. Finally, comma, you get out the croutons." ..."Two cans of motor oil," says Deswick, referring to the (ingredients) in his favorite salad. This gets a big laugh from the students...Deswick keeps talking...It's loud enough that the students around him can hear. Gabriel and Vivian are paying a lot of attention...Miss Baker, however, chooses to direct her desists toward Gabriel. "Gabriel, are you done? It looks like you're playing."

Deswick has passed a sheet of paper to Gabriel, who has handed it to Danny - I don't know what's on it; perhaps Deswick's salad recipe--As the paper is passed there's conversation among the participants. Stella turns and simply stops reading (her recipe aloud to the class), and looks at the boys who are talking. After a minute, Miss Baker says, "Okay, wait a minute. I can't hear Stella because there's some noise going on. And you know who you are." "Who is it?" says Deswick loudly.

Deswick is talking and Miss Baker turns around and tells him quietly to be quiet. Deswick says something like, "But I'm doing my work," loudly. "Well, don't bother people." Miss Baker says.

Deswick calls out to Miss Baker, "Miss Baker, you know what Gabriel says--let me tell you in your ear." He waves her over to his desk. She bends down and he whispers something in her ear.

"I know all about commas," Deswick calls out. "Okay," says Miss Baker, "We'll see if you do." Her tone is sceptical, but not sarcastic. "Page eleven, number one, Deswick. You know all about commas. Read number one." "Why do you call on me first?" Deswick demands. "Because you know all about commas," she says, mockingly. "No, come back to me, later on," says Deswick. "Come back to you. All right. Let's see, number one--Danny."

Miss Baker calls on Alan to do the next exercise (Whom did you see Elizabeth). Alan stalls on the first word. Deswick is calling out, "Comma, comma," and finally Alan says that there should be a comma after "whom." Miss Baker says, "No, there shouldn't be a com-

ma there." "Ah ha. I made you mess up," says Deswick. "There ain't no comma by 'whom.'" At this point Miss Baker calls Deswick down, telling him to "keep it down." Deswick seems hurt and says something like, "I ain't gonna talk now." "I don't like you making fun of people when they make mistakes." Miss Baker continues. "You let 'em laugh at me when I make a mistake," Deswick says. "But you like it, Deswick, they don't." A lot of the other kids laugh at this.

Though Deswick would obviously present a tough problem for any teacher to handle, Miss Baker might be better able to manage him if she were not so concerned about keeping him happy at the same time. She mentions this specifically in one of her stimulated recall interviews, noting that at one point she had moved him to the back of the room, where he could not command so much of his classmates' attention, but "he was back there in this corner, and all he did was pout and pout and pout...so I let him move back up...I guess I don't want him to be totally unhappy." In this instance, then, Miss Baker's tendency toward more complexity of thought, particularly her desire to accomplish two things at once, creates a classroom conflict which she seems unable to solve.

In the final analysis, the classroom interaction data support the supposition that the image of teacher as racer may clarify our vision of Miss Baker. We view her as a teacher who is running a fairly good race, but we now see how she slips around certain hurdles, takes other well in stride, and trips over the one she has set in her own path, the hurdle created by her need to achieve a double victory.

Final Figures

We began this exploration of teacher thinking with descriptions

of the cognitive processes and conjectures about the implicit beliefs of two teachers who differed rather drastically in their procedures for classroom management and discipline. Our initial characterizations were based on data from stimulated recall protocols, which had been analyzed in several different ways. Mr. Allen was revealed as a single-minded thinker, with two apparently conflicting images of teaching. On the one hand, his metaphoric language referred to the teacher as an effective combatant in the behavioral battle of the classroom, supported in his authority by "the office," which stood strongly behind him. On the other hand, he revealed an image of the teacher as an ineffective entertainer, faced with a basically bored audience, but still, more concerned with completing the script than with audience participation. Miss Baker appeared as a relatively complex, yet consistent, thinker, viewing her instructional and behavioral management roles in an integrated fashion. The image of teaching that she projected was that of a racer, pressing ever onward with her pupils, steering her course by the speed of their responses and their pleasure in participation, and being thrown off her pace occasionally by the regulations of the office, or the social needs of certain students.

These first impressions have worn pretty well through the process of testing them against information from two entirely different data sets: findings from three administrations of Kelly Repertory Grid interviews; and classroom protocols derived from ethnographic observations of interactive teaching behavior. While the original con-

structions have not been ripped apart at the seams, they have been redesigned to a degree. In their final form they have much cleaner lines, as well as more decorative detail. Let us now take one last look at the new, improved models that the process has produced.

A Critical Review

Mr. Allen is a single-minded thinker, who has some strong beliefs about teaching. His explicit beliefs about teaching are: pupils learn by repetition; the busier you keep students, the less problems you have; and students should be scared to talk, but encouraged (or coerced) to volunteer to answer questions. His implicit beliefs may be framed in the image of teacher as "entertainer."

Mr. Allen feels hampered by his own lack of knowledge of Texas history, which is the subject that he teaches several periods a day. To compensate for this lack of knowledg he relies on the textbook as a script, and he follows this script very closely. Pupils read their lines from this script every day, rehearse them as they answer textbook questions both orally and in their notebooks, and give their final performance of them in periodic unit tests. The script is monotonous, and Mr. Allen suspects that his students find it boring, as he does himself. To relieve the boredom, he entertains his students with stories that he gleans from reading books and newspaper articles about Texas history.

But story telling is not enough. He has devised another form of entertainment. Students become his foils in a series of war games. Even the war games are conducted according to a script, this time

written by Mr. Allen, which details each possible transgression, and its attendant punishment. The games of "catching" the transgressors and punishing them are amusing to the class as well as to Mr. Allen.

Mr. Allen clearly states his awareness of the need for some reserve forces, even in a war which is only a game. He acknowledges that the games might become serious (he would really get angry) if he couldn't rely on the office backing him up. He notes that the office/principal doesn't like it when students fail, so he engages in a variety of manuevers to insure that student grades are kept "up" ("B" is "average"). The most important of these involve sticking tightly to the lesson script, rehearsing pupils daily for the tests which will determine their grades.

Thus, while Mr. Allen is a single-minded thinker, his thinking about teaching does not move along on a straight line. Instead it circles back on itself, continually tracing and retracing the same path. He is locked in to a cycle of beliefs and behavior which would be very difficult to break, should he ever desire to do so. There is no evidence, however, to suggest that he seriously entertains any such desire.

The Daily Double

Miss Baker is a rather more complex conceptualizer, given to consideration of alternatives, a teacher who displays some tendency to be goal-oriented and self-evaluative. She too has strong beliefs about teaching, but they are not so simply stated. At least three

explicit beliefs can be identified:

1) A teacher's first job is to teach. Behavioral management tasks which somehow interfere with this primary purpose can legitimately be ignored, or circumvented;

2) Pupils are people first of all. A teacher needs to aid in their social development and help them feel good about themselves. In return, pupils will probably like the teacher, which can make the teacher feel good about herself; and

3) Both pupils and teachers can and should continually learn, grow and progress (change).

Miss Baker's implicit beliefs may be framed by the image of teacher as "racer."

Miss Baker feels impelled to cover ground (curriculum), to move students (help them change and develop), and to progress herself (try new things, be flexible in her teaching). This push results not from any sense of threat of outside evaluation but rather from an inner drive to preserve her own sense of accomplishment. Thus, she strives daily to achieve two different instructional goals in a single lesson, to adjust for the individual learning needs of pupils as well as move the whole class towards a real understanding of a common curriculum, and to keep pupils participating happily, and "liking" her, as she runs them through their paces, or daily exercises. These are the "daily doubles," on which she places her bets, and she does not watch the outcomes idly from the sidelines. She is in there struggling energetically to the end of every race.

These double purposes, to which she seems almost addicted, are just another indication of the tendency toward complexity in her

thinking. This tendency is at once her strength and her weakness as a teacher. It is her strength because it enables her to be reflective about her teaching, alert to many aspects of her instruction and management, aware of the many individual characteristics of pupils, and able to take all of these elements into account in her interactive decision making. It is her weakness because it leads to problems when her dual purposes conflict, and she is unable to choose between them.

This is the source of her difficulties with Deswick. She wants him to be happy in her classroom and she wants to maintain the pace of the lesson. Deswick's seemingly insatiable hunger for the attention of his classmates, and his well-practiced interruptive strategies for filling that hunger, make these dual purposes completely incompatible. But Miss Baker cannot give up one goal in order to achieve the other. She continues to strive, unsuccessfully, for a winning combination.

Miss Baker's hopes, and our hopes for her, lie in her belief that both she and Deswick are capable of change. This belief has been reinforced in the past, as she has seen other students change through her efforts, and as she has demonstrated to herself her ability to learn and use new techniques. The varied techniques which she has tried, inconsistently, with Deswick to date have not worked. But as she keeps trying, she may yet stumble on one that will. Or, as she keeps pondering the problem, she may yet develop the insight that it is possible, on occasion, to limit oneself to

one goal at a time. Mr. Allen could have told her that, all along.

On Finding the Forest After Tapping the Trees

One of the dangers inherent in any research utilizing qualitative data is that the researcher may become so enmeshed in the detail of the data that it becomes difficult to step back and see the larger picture. The greater the quantity of detailed data available, the greater this danger becomes. Also, the more powerful the data, that is, the more it reveals intricacies and idiosyncracies of the subject, the more real this danger becomes. With these particular case studies, the danger is very real indeed. It is important at this point, therefore, to remind ourselves of the initial purpose of our sojourn with these particular trees.

This paper is primarily concerned with methodology for investigating teacher thinking. A critical methodological issue, given the fact that thought is never directly observable, is the validity of information obtained by methods which essentially involve self-report. A number of researchers involved in studies of classroom teaching have used variations of a procedure which has come to be known as "triangulation," in order to increase the validity of their findings. This procedure typically involves comparison of the perspectives of three different observers of the classroom scene, to get a better "fix" on the "reality" of the setting. This paper has explicated a rather atypical process of triangulation, one in which three different perspectives of teacher thinking are provided by three

different approaches to data collection and analysis. It is time now to back away from the individual trees that we have been examining so closely, in order to see the forest. We need to review the steps in the triangulation process, and consider the strengths and possible weaknesses of this methodological procedure.

Essentially, the procedure which has been illustrated here is one of continuous testing and refinement of descriptions on the basis of new data. The transformation which our initial characterizations and conjectures have undergone should be clear. The step-by-step explanations of these transformations have, hopefully, illustrated the techniques by which triangulation was accomplished, through careful comparison and alignment of complementary points. Quantitative data have been informed by qualitative data. Stimulated recall data have been analyzed in a variety of ways, to provide more elaborated descriptions of teachers' cognitive processes and beliefs. Descriptions derived from stimulated recall data have been tested against data obtained through Kelly Repertory Grid interviews and ethnographic records of interactive classroom behavior. Each new data set has been examined in light of the description resulting from a prior analysis. Each new data set has corroborated certain aspects of prior descriptions, failed to address other aspects, and called for revision of still other aspects, so that the description has been shaped and reshaped a number of times.

Presumably, the process has provided us with a way of testing

the information provided by each different data set. But how can we test the process itself? There are a number of questions that need to be asked as we attempt to evaluate the potential usefulness of this form of triangulation as a method for investigating teacher thinking. The questions are these:

1. Is the description derived from the initial set of data analyzed actually corroborated and revised on the basis of the new data?

2. Is the description extensively enriched by the addition of the new data?

3. Have the researchers involved in collecting the individual sets of data gained new insights into (explanations for) the thinking and behavior of the teachers studied, as a result of mining the additional data sets?

4. Are the validations, revisions, enriched descriptions, and new interpretations that may have been derived extensive enough to justify the additional time and energy (not inconsiderable) required to collect and analyze the additional sets of data?

5. Have the data obtained from the various approaches been used in ways that do not violate their integrity, or the assumptions underlying the procedures associated with their collection?

6. Does the triangulation procedure yield reliable results? That is, how similar would the final description be if we had begun the analysis at a different point on the triangle?

For the case studies presented in this paper as an illustration

of the triangulation procedure, I would argue that the answer to the first four questions listed above is "Yes." The reader may judge for him/herself the appropriateness of this position in response to the first two questions, on the basis of the descriptive detail provided throughout the paper. Discussions with the other researchers associated with the project from which the illustrative case studies were taken suggest that they strongly support my position in response to questions three and four. The fact that these questions can be answered in the affirmative for this particular project, however, does not imply that this will be the case for every study of teacher thinking.

Question five is somewhat more difficult to deal with. It would be rare for any one researcher to be fully experienced and adept at dealing with three approaches to data collection as diverse as the three presented here, and such is certainly not the case in this instance. I realize, for example, that my analysis of the Kelly Repertory Grid data involved much more interpretation of the data by the researcher (as opposed to explication by the teacher) than would ordinarily be the case. Though I have sought feedback on my analysis from others much more practiced in use of this method, and received some support as well as helpful suggestions, I am not altogether certain that all researchers familiar with this approach would approve my application of it here. The answer to question five must therefore await the reactions of researchers who regularly use these alternative methods.

The most difficult question of all is question six. I began the analysis of data with the stimulated recall protocols because this is the procedure with which I am most experienced. Having completed my immersion in these various data sets in the order in which I confronted them, it would be impossible for me to begin again at another point with a fresh and unbiased view. The only reasonable way to answer question six would be to have three different analysts begin at three different points on the triangle and proceed simultaneously through the data, comparing their results at the end. This could be a fascinating exercise, which I leave to others to undertake.

But note that the sixth question is a question that would only be asked by a researcher in the quantitative tradition (Smith, 1983). It assumes that there is a single reality out there, that there is one accurate way of describing the mental life of a teacher, and that our task is to approximate that one accurate description as closely as possible. The most important question to the qualitative researcher would be question three, which assumes instead that there are many different "realities," and that our task is to find a way of representing the perceptions of others so that we ourselves can see a different "reality" than the one we initially perceived, and invite others to share in our new perception.

This is a critical distinction to make, for the reader must understand that the "final figures" described earlier are <u>representations</u> of the behavior and thought of these two teachers. They do not pretend to be the reality. It is true that the words and

actions of these teachers are the materials out of which the figures have been constructed. It is true that the constructions allow us to interpret the words and actions of these teachers in new ways. It is not true that the constructions are the teachers.

Perhaps, given the use of imagery and metaphor throughout this paper, it is appropriate to conclude by suggesting that the best test of this methodology is to compare the portraits of the two teachers that were painted with the brush of categorical analysis (which is the point at which many studies of teacher thinking stop), with the two portraits framed as "final figures." At what point might teachers begin to recognize these as portraits of themselves? The first set of portraits are like kindergarten children's crude attempts to "draw a man." The second set would never be mistaken for "old masters," but they are certainly more rich in color and detail, and more skillfully delineated. The difference is not in the ability of the artist, since both were painted by the same hand. The difference is in the use of a variety of techniques to achieve the final effect. The artist knows the necessity of mastering and using a variety of techniques to create images. Perhaps it is time that we researchers learned this essential secret.

Notes

1. In this particular comparative case study, objectivity was perhaps enhanced by the fact that I did not participate in actual collection of the data, and never met the two teachers face to face.
2. These same four lessons provide the basis for all of the comparative analyses of stimulated recall data discussed here.
3. The proportional frequency was determined by the number of comments in each category divided by total number of comments coded.
4. In this instance, Miss Baker was much more talkative than Mr. Allen, making a total of 151 coded comments in discussing the two lessons under consideration, as opposed to his 56 comments.

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